WORK

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FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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Fig. 6.

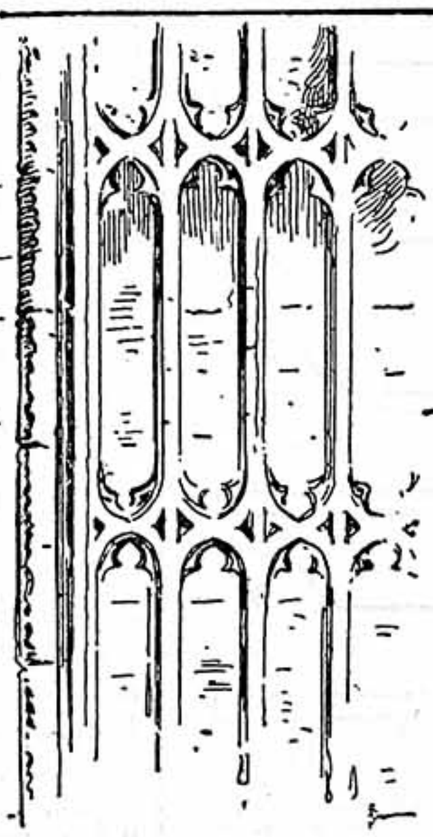
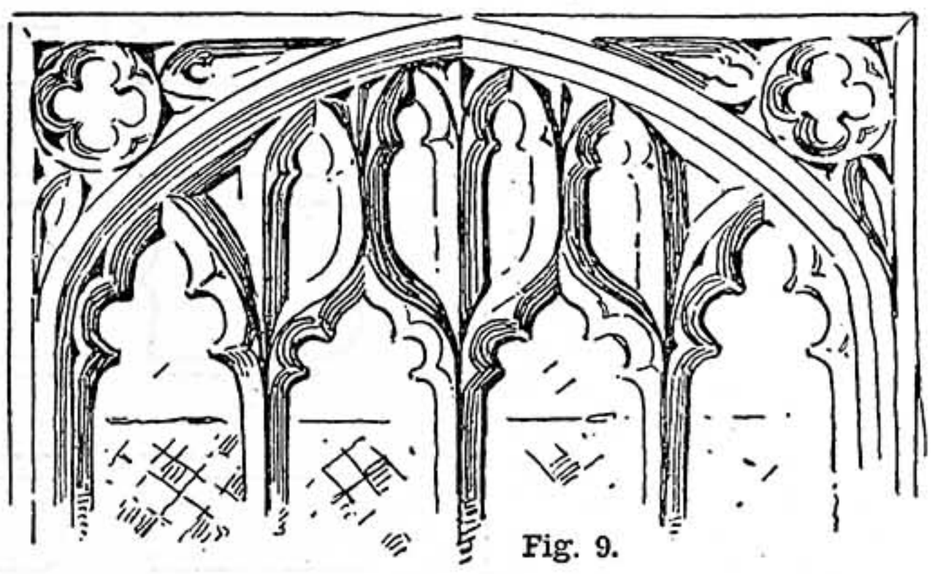


Fig. 9*a*.



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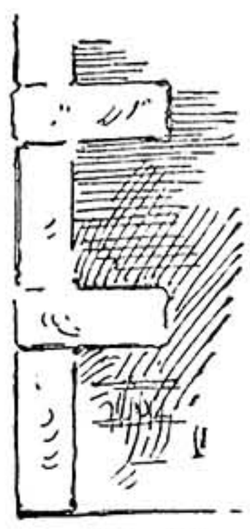
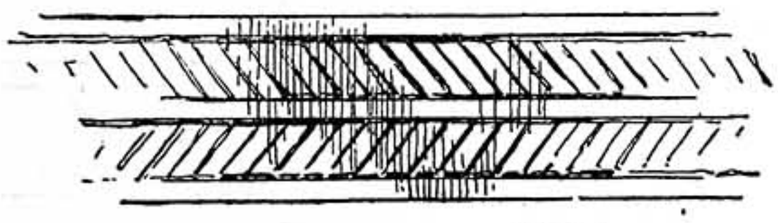


Fig. 5*b*.



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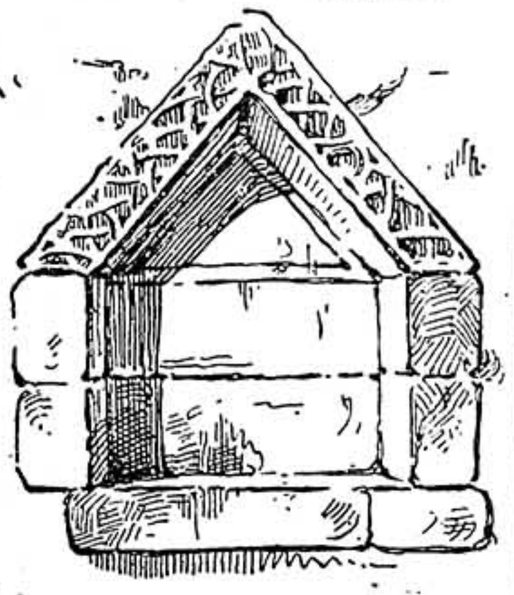

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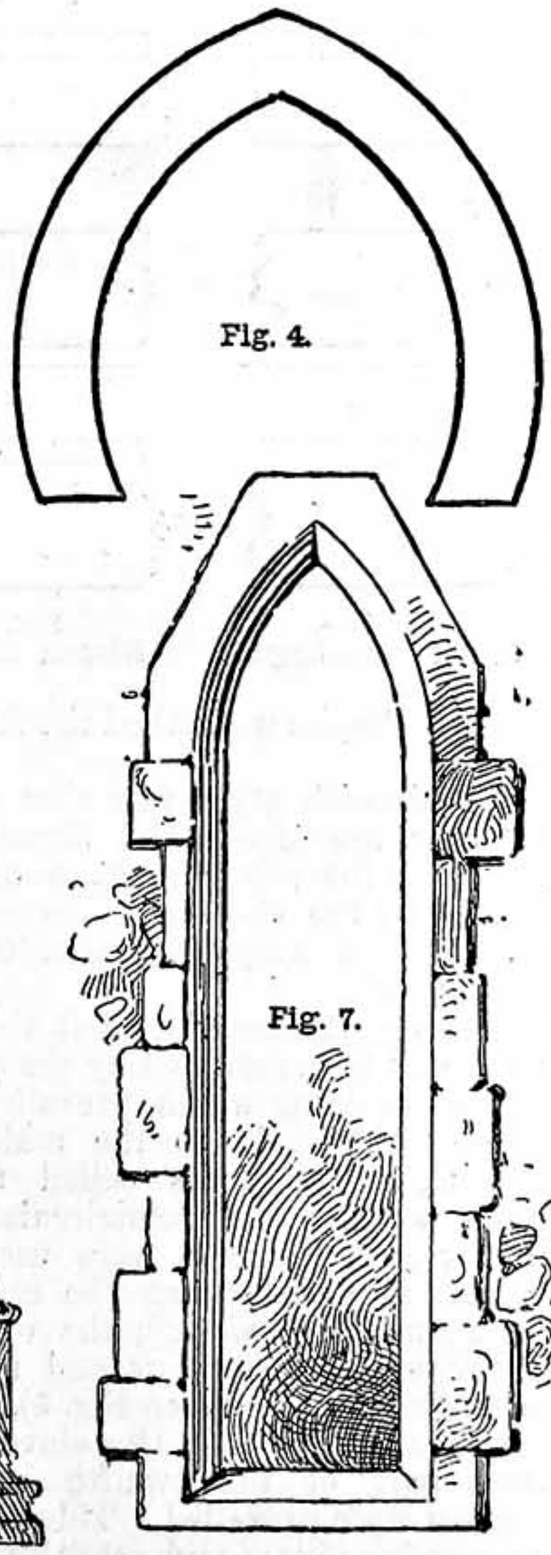

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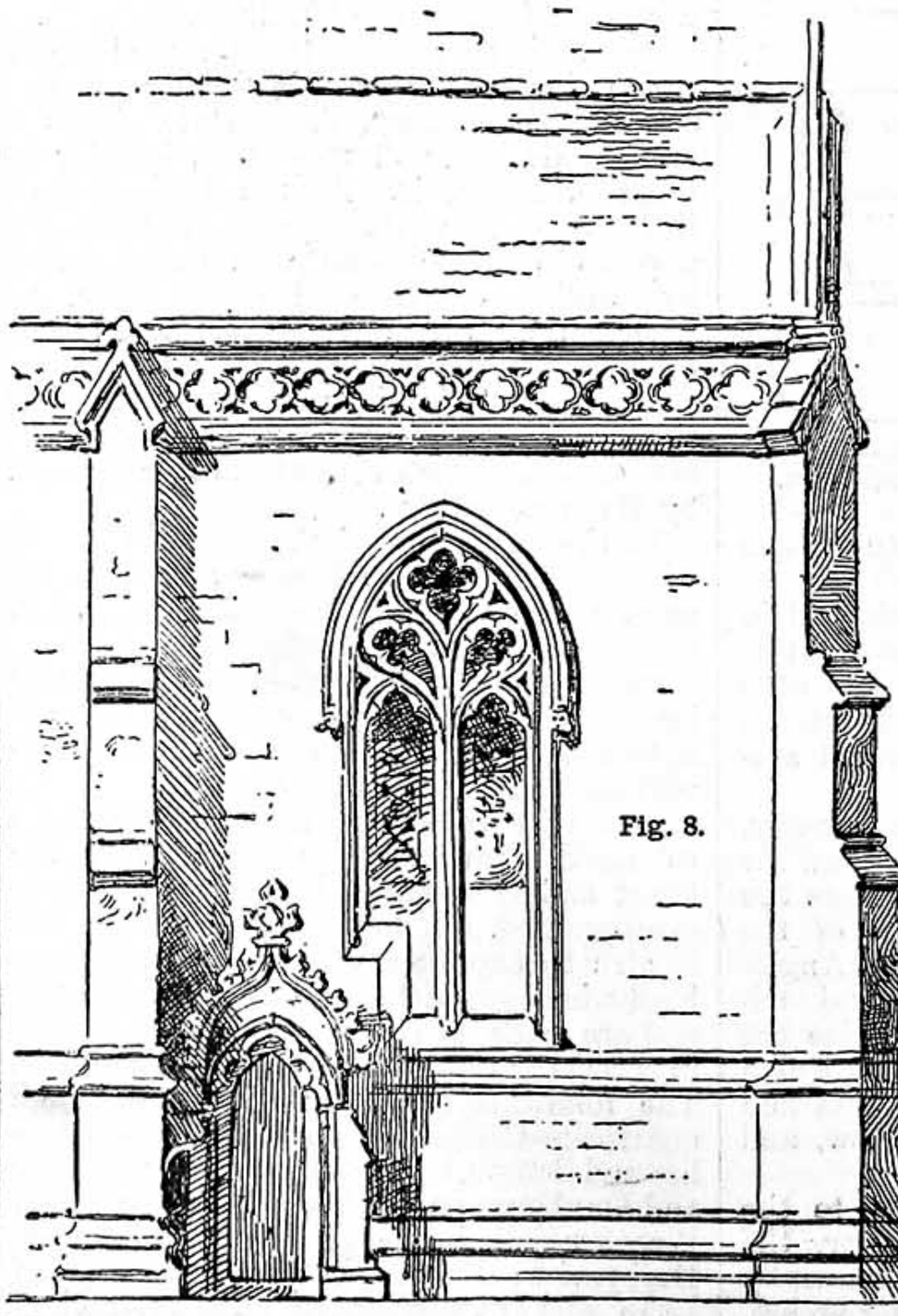

Fig. 8.

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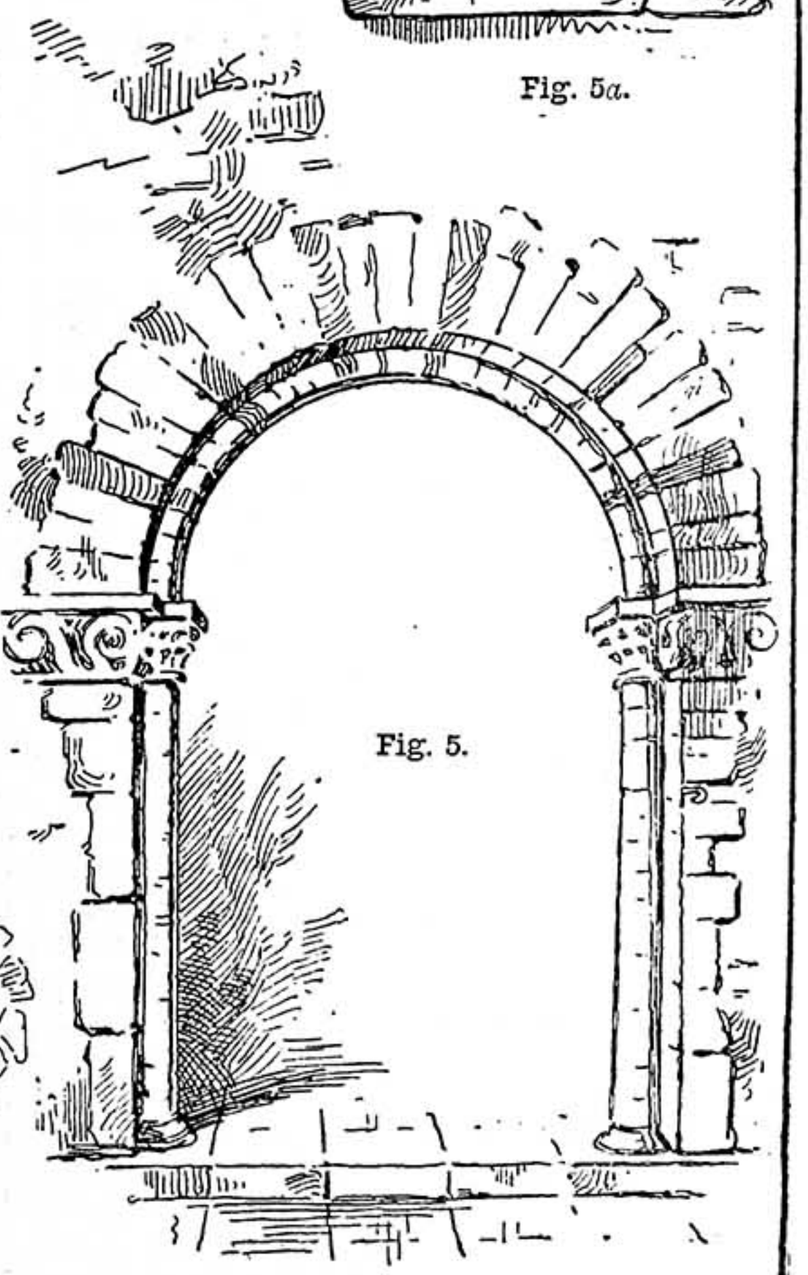
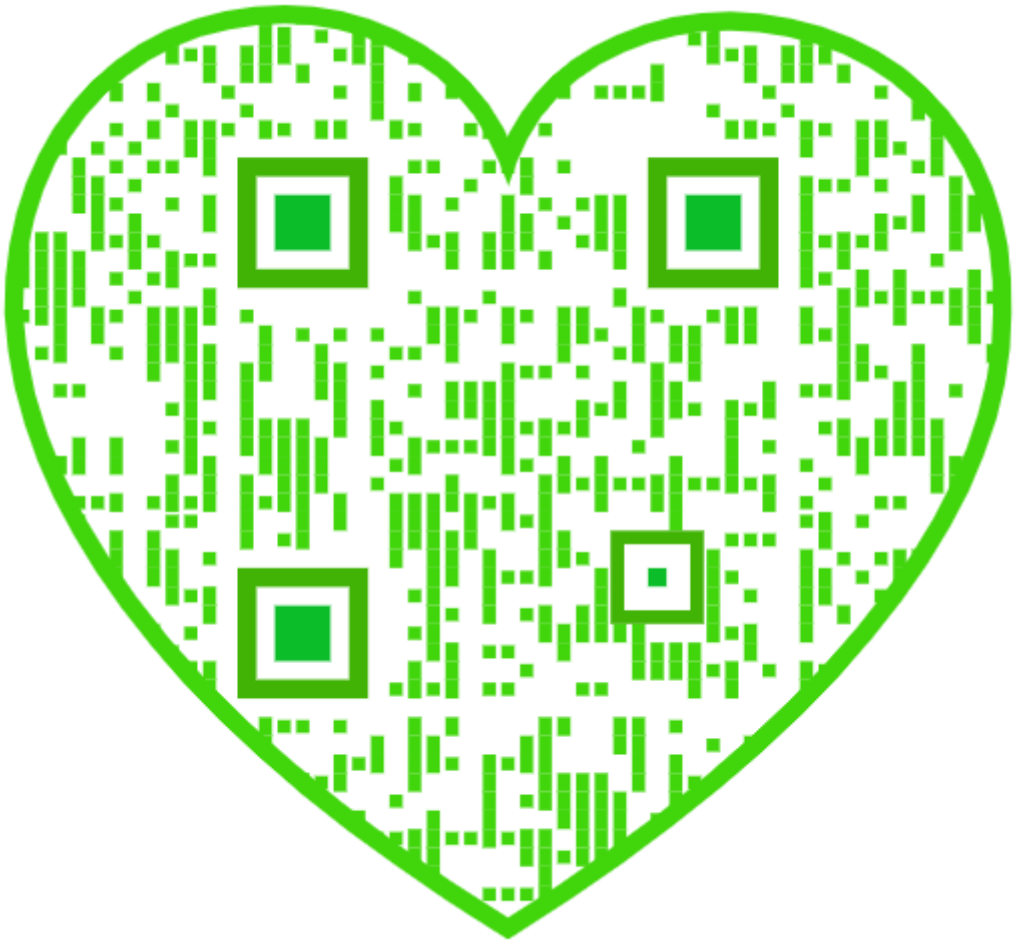


Fig. 5.

MASONS' WORK. Fig. 3.—Herring-Bone Work. Fig. 4.—Moorish Arch. Fig. 5.—Anglo-Saxon Style: Semicircular Arch. Fig. 5*a*.—Triangular-Headed Arch. Fig. 5*b*.—Long and Short Work. Fig. 6.—Norman Style: Doorway. Fig. 7.—Early English Style: Lancet Window. Fig. 8.—Decorated Style. Fig. 9.—Perpendicular Style: Window. Fig. 9*a*.—Wall Panelling.



MASONS' WORK.

BY MUNIO.

ANCIENT MASONRY—COMPONENT PARTS OF FIVE ORDERS OF ARCHITECTURE—BASE—SHAFT—CAPITAL—ENTABLATURE—STYLOBATE—PEDIMENT—GREEK AND ROMAN MOULDINGS—BYZANTINE AND ROMANESQUE STYLES—MOORISH STYLE—ANGLO-SAXON—NORMAN—EARLY ENGLISH—DECORATED—PERPENDICULAR—DEBASED—GOTHIC—VARIOUS STONES USED IN MASONRY—WEIGHT AND CRUSHING STRESS OF STONES.

Historical Styles and Stones in Masonry.—Masons' work is the art of dressing or cutting stones, and of setting or fixing them together in masses to form various kinds of buildings.

The art must have attained to great perfection at a very early period, as evidenced by the remains of cities, temples, etc., built by the ancient Egyptians, Assyrians, Persians, and other nations of antiquity.

The masonry of these nations was characterised more by gigantic proportions and profuse decoration than by what we term elegance of design. Immense blocks of stone were used. The obelisk now standing on the Thames Embankment, and known as Cleopatra's Needle, is an Egyptian stone.

The Greeks passed from these gigantic forms, and built their temples with great elegance and dignity. We are indebted to them for three of what are now known as the five orders of architecture—the Doric, the Ionic, and the Corinthian.

The following terms are used to denote the component parts of the five orders:—The lower part of a column is the base, the middle part the shaft, and the upper or ornamental part the capital. The entablature is the horizontal portion resting on the top of a range of columns. Its lowest portion is called the architrave, the middle portion the frieze, and the upper or projecting portion the cornice. The lower portion of a base or pedestal of a column is called the plinth, the middle portion the die, and the upper portion the surbase.

The stylobate is either a platform with steps, or a continuous pedestal supporting a range of columns. A pilaster is half a column attached to a wall, and is sometimes rectangular.

A pediment is a triangular gable over a range of columns, with a cornice; the portion under the cornice is called the tympanum.

The mouldings used by the Greeks are shown in Fig. 1. A is the fillet, B the astragal or bead, C the cyma-recta, D the cyma-reversa or ogee, E the echinus or ovolo, F the cavetto or hollow, G the scotia, H the torus.

The Greeks called their random walling opus incertum; walls formed in regular courses were called isodomum; and walls faced with regular courses, but filled with rubble, were called emplectum. They also used a kind of walling called reticulatum, formed with square stones laid diagonally.

The Romans absorbed the three Greek orders, and added two more—the Tuscan and Composite. The Roman mouldings are shown in Fig. 2, and are named the same as the Greek. The Romans used courses of thin tiles in some of their walls, and in others the stones were laid in a sloping form, called herring-bone work (Fig. 3). The Romans were the first who made use of the arch to any extent; as, although arches have been found at Nineveh and Thebes, these nations did not make much use of it in construction—they usually covered their openings with large stones.

A curious dome-shaped building was found at Mycenæ, in Greece, in which the stones forming the arch have level beds, the ends being projected, and cut to the curve on the under side. It is most probable that we are indebted to the Romans for the introduction into this country of what may be termed scientific masonry.

After the time of Hadrian, the art began to decline among the Romans. When the Empire was divided, the art which was practised at Constantinople was called the Byzantine style, while that practised in the

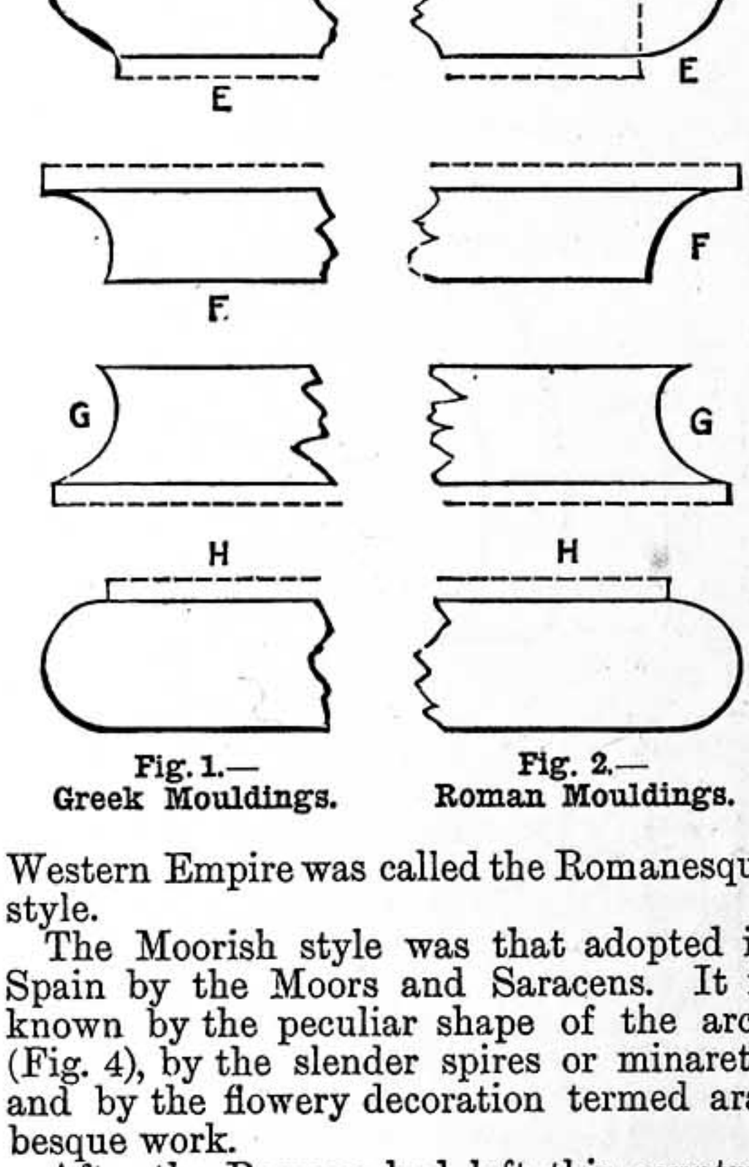


Fig. 1.—Greek Mouldings.

Fig. 2.—Roman Mouldings.

Western Empire was called the Romanesque style.

The Moorish style was that adopted in Spain by the Moors and Saracens. It is known by the peculiar shape of the arch (Fig. 4), by the slender spires or minarets, and by the flowery decoration termed arabesque work.

After the Romans had left this country, and it had been subdued by the Saxons, the style of building which prevailed from the close of the sixth to the middle of the eleventh century was called the Anglo-Saxon style. The semicircular and triangular-headed arches were used, also the peculiar arrangement at the quoins called "long and short work"; the windows and doorways were very low and narrow, and the walls very thick (see Fig. 5).

From the middle of the eleventh to the latter part of the twelfth century, the Norman style prevailed. This is known by the massive pillars and semicircular arches. The doorways were large, and deeply recessed, the arches in the latter period being carved with zigzag and other mouldings (Fig. 6).

Succeeding this style, and extending to the end of the thirteenth century, was the Early English style. This is known by the pointed arch. The piers were formed of numerous slender shafts clustered together, the capitals being carved with foliage. The windows were arched with pointed arches, single ones being termed "lancets." Sometimes three or more were grouped together, gradually rising to the centre. The doorways had moulded arches with a projecting hood mould or dripstone (Fig. 7).

At the end of the thirteenth century, by a gradual and imperceptible progression, the Early English merged into the Decorated style, which existed to the end of the fourteenth century. In this style a greater profusion of ornament was introduced. The windows were large, and divided by slender shafts of stone called "mullions," which in the heads were formed into geometrical or flowing figures called "tracery." The doorways were more ornamented, and pediments and pinnacles with projecting ornaments called "crockets" were used. It is generally considered to be the most beautiful style (Fig. 8).

During the fifteenth century a more elaborate style, called the Perpendicular style, prevailed. The windows were large, and the geometrical tracery was superseded by vertical mullions in the heads. The doorways were covered with low, pointed arches, with a square hood moulding over them. The walls, both on the interior and exterior, were covered with panelling in stone. Elaborate roofs of what is termed "fan vaulting" were used, as at Henry VII.'s Chapel, Westminster, and King's College, Cambridge (Fig. 9). During the latter period of this style, the Elizabethan or Tudor style and the Jacobean style were used in domestic buildings.

Succeeding this was the Debased style, which existed till the beginning of the seventeenth century. This style shows a gradual decline, and was much inferior to those preceding it. At the beginning of the seventeenth century pointed architecture appears to have died out, and was replaced by Italian or classical architecture, as practised by Sir Christopher Wren and others.

The term "Gothic" was applied about the end of the seventeenth century to the mediæval architecture as a term of contempt, by Wren and others.

In the early part of the present century, what is known as the Gothic revival set in, since which time some excellent works in masonry have been executed.

Stones Used in Masonry.—The stones used by masons are the freestones, which are obtained from the coal measures in various parts of the country. These stones vary in colour from nearly white to dark brown; in texture from the finest and close-grained to very coarse or open-grained. Some are very soft, but harden by exposure, while others are very hard when quarried. Some are laminated, and are made into landings, flags, etc.; while in others the beds are hardly distinguishable. The following are some of the principal quarries:—Craigleith, near Edinburgh; Prudhoe and Benton, in Northumberland; Pensher and Dunhouse, in Durham; Park Spring and Bramley Fall, in Yorkshire; Hollington, in Derbyshire; Mansfield, in Notts; Forest of Dean and Painswick, in Gloucestershire; Doulting in Somersetshire, etc.

Stones from the Lias formation are

quarried near Whitby and other parts of Yorkshire.

Limestones are quarried at Ham Hill, Chilmark in Wilts, and Barnack. Magnesian limestones are quarried at Park Nook, Roach Abbey, and Bolsover. The new red sandstone is quarried at the Minera quarries in Denbighshire; the old red sandstone in Cumberland and Westmoreland.

From the upper Oolites are quarried Portland and Purbeck stone. There are two kinds of Portland stone—the brown, which is a weather stone, and the white, which is only suitable for interior work. The Ketton, Ancaster, Clipsham, and Casterton stones are also from the same formation.

From the lower Oolite is obtained the Bath stone. The numerous quarries of this stone are now worked by one company, called the Bath Stone Firms. There are eight different varieties of this stone: the Corsham Down, used for sculpture and mouldings; Box Ground, for exterior work of all kinds; Farleigh Down, for partition walls and face work; Corngrit, suitable for weight-bearing purposes, as columns, also for landings and staircases. Stoke Ground, Winsley Ground, Westwood Ground, and Bethel, are suitable for general purposes not too much exposed, and for interior use.

Caen stone is imported from Normandy for interior use, but it is now nearly superseded by Bath stone.

Granite is obtained from Scotland, Cumberland, Wales, Devonshire, Cornwall, etc.

Kentish rag is a limestone, and is obtained from the Greensand.

A basaltic stone of blue colour is used in Cumberland and Westmoreland for walling, called "ragstone."

Freestone is generally composed of siliceous grains or quartz, cemented together by siliceous, argillaceous, or calcareous matter.

Limestones are composed of carbonates of lime and magnesia, mixed with silica and alumina.

Oolites are composed of oviform bodies, cemented by calcareous matter of various kinds. The granites are composed of quartz, felspar, and mica in various proportions.

The selection of stones for masons' work requires great care and consideration. They should be able to resist the action of a smoky atmosphere, of moisture, wind, rain, and frost. Stones used in the vicinity of where they are quarried often stand the weather better than when used in a large town.

It has been found, by experiment, that stones which have the greatest specific gravity possess the greatest cohesive strength, absorb the least quantity of water, and disintegrate the least by the action of the weather.

Freestones absorb less water, but disintegrate more than magnesian limestones.

The stones should always (except in certain cases) be set on their natural or quarry bed. Some stones also require to lay for a certain time to "weather" before being used, while others may be used direct from the quarry.

The weight of a cubic foot of freestone is from 130 lbs. to 160 lbs., and its crushing stress from 4,000 lbs. to 8,000 lbs. on the square inch. Portland stone weighs 147 lbs. per cubic foot, and its crushing stress is 3,200 lbs. per square inch. Limestone weighs 170 lbs. to 180 lbs. per cubic foot, and its crushing stress is from 3,000 lbs. to 8,000 lbs. per square inch. Bath stone weighs 123 lbs. per cubic foot, and its crushing stress is from 1,800 lbs. to 2,000 lbs. per square inch. Granite weighs 160 lbs. to 170 lbs. per cubic foot, and its crushing stress is from 5,000 lbs. to 12,000 lbs per square inch.

In some districts flints are used for walling. They are generally walled in frames fixed to the thickness of the wall, the angles being formed with stone or bricks; they are sometimes walled rough and plastered on the face, and sometimes split, squared, and jointed.

THE SAFETY BICYCLE: ITS PRACTICAL CONSTRUCTION, ETC.

BY A. S. P.

POSITION OF RIDER IN RELATION TO HANDLE BAR AND PEDAL SHAFT—STEERING—RELATIVE POSITION OF SADDLE, HANDLES, AND PEDAL SHAFT—STEERING LINE IN RELATION TO FORKS—POSITION OF SADDLE—DOUBLE ADJUSTMENT OF HANDLE BAR—PNEUMATIC TYRES—CUSHION TYRES.

THERE is great divergence of opinion among cyclists with regard to the proper position of the grip handles in relation to the saddle, and the position of both in relation to the pedal shaft. Controversial letters are continually cropping up in the cycling journals on this vexed question. If these wranglers would consider for a moment that what suits one does not suit another, they would speedily set the matter at rest. Build and adjust two machines exactly alike in every particular, and mount two riders of the same height and length of limb; as like as not, they will disagree as to the adjustment, simply because the two men are not built alike in every particular. The two men do not walk alike, neither can they be expected to ride alike, and each must adjust the machine (if it is capable of adjustment) to suit himself.

The forward point, or nose of the saddle, is usually the point from which all the positions are taken. Now, in the case of an ordinary bicycle the nose of the saddle is from 2 in. to 3 in. behind a line drawn through the grip handles; then the axle, with its cranks, may be 2 in. in advance of this line through the handles; consequently, the axle to be turned by the feet is from 4 in. to 5 in. in advance of the nose of the saddle. Now, this condition of things suits the majority of riders of the ordinary, but not all. Some would have their pedals vertically under the middle of their saddles, which would be some 9 in. behind the adjustment given above, and, of course, they cannot get it on an ordinary. They may get it on a "Facile," which is worked by levers projecting backwards; but it cannot be called an ordinary—it is a cross between the ordinary and the equal-wheeled safety.

Now, if a certain adjustment of saddle and handles in relation to the wheel centre in an ordinary is found to be good by the majority of riders, there is no reason why the same positions should not be good in a safety; but I have never yet seen a safety so adjusted. The saddle may be placed well enough in relation to the pedal shaft, but the grip handles, instead of being placed 2 in. in advance of the saddle nose, are from 8 in. to 12 in. in advance; consequently, the rider has to stoop forward in order to grasp his handles.

The leisurely rider of the ordinary sits bolt upright in his saddle, with his arms down by his sides, and grasping his handles comfortably and naturally, on a line passing across at the angle of his trunk with his legs.

The safety rider is debarred this easy, natural position, and sits—or rather, lies—with his back arched, as if he were searching for something over his front wheel. Natural bicycle riding should be assimilated to natural walking. Let anyone try how far he will walk comfortably leaning forward at an angle of 45 degrees.

Most safeties are constructed so that the nose of the saddle will touch a line rising vertically from the centre of the driving spindle, or bottom bracket, and the saddle and spring, being mounted on an L-pin, are capable of being adjusted several inches backwards or forwards. Now, suppose the saddle is as far forward as it will come, the rider mounts, and finds it is all right in relation to the grip handles, but it is too far forward in relation to his pedals. He sets the saddle back 3 in., and finds a great improvement in relation to his pedals. But what is the result in relation to the grip handles? Simply that he is 3 in. further away from them, and has no means of bringing them back, for no safety, so far as I am aware, has the means of adjusting the handle bar horizontally; the only adjustment being vertical, or rather in the direction of the steering post. Now this is where the difficulty of a careful adjustment all round exists in the safety, and until makers remedy this, the machine cannot be said to have arrived at what may be called perfection. To adjust the handle bar horizontally is by no means a difficulty, as I will have occasion to show by diagram a little further on.

Another vexed question is the steering of safeties. The ordinary may be steered by the feet alone, because the feet have control over the steering wheel; but in the safety the feet have no control over the steering wheel whatever. The safety is the most tricky machine of any to steer, being constantly liable to wobble; very few racers even can steer without wobbling in a manner never seen on an ordinary. But all safeties are not tricky alike, any more than all row boats are not crank alike, and this is by reason of their build. In the case of the safety, the set of the front fork and steering post have much to do with the steering, and when these are skilfully set, the difficulty of steering is much reduced, and riders with much practice can steer some makes of machines for considerable distances without touching the handle bar.

Accompanying this paper is a line diagram, intended to show the relative position of the saddle with handles and pedal shaft. It will also be a clear guide in making a full-size drawing of the machine, securing, as it will, the relative positions here indicated. A, A, Fig. 2, are two 30 in. wheels; their distance apart, or the space between their runs, is 12 in. In this space is the pedal shaft, B, 3 in. clear of the rear rim, and 12 in. above the ground line. Now, taking the fore, or steering, part of the machine, we draw the line C D, which is a vertical line, from the centre of the wheel to the ground line, the wheel having contact with the road at the point D. Now from the centre of the rear wheel we draw a line E F, and 4 in. above the periphery of the front wheel, at E. Next we draw a line at right angles to E F from C, passing through E; this latter will be the steering line if the forks are straight. Three inches further back is another line, G H, parallel to E C. This is the steering line if the forks are curved, and the amount of curve 3 in.; so that this diagram serves for

either straight or curved forks. It will be observed that the straight fork machine will have a backbone or frame that is 3 in. longer than the other, with curved forks.

Now I have to call particular attention to the steering properties of these two forms of forks. It will be observed that the line of the curved fork, G H, falls on the ground line in advance of the vertical line C D, and that the line of the straight fork, C E, prolonged to J, falls in advance of H. H is 4½ in. in advance of D; and J in advance of H 3 in., or 7½ in. in advance of D. The point of resistance being at D, the machine will steer better if made with straight forks, the distance between the point of resistance and the line centres being greater by 3 in. than if built with curved forks.

Now, with regard to the position of the saddle, it will be seen that in the diagram the nose of the saddle touches a vertical line rising from the pedal axle centre. For a rider with a 32 in. leg, the saddle would be 36 in. high. The L-pin should have each arm 6 in. long, and the vertical arm being placed 3 in. behind the vertical line rising from B, the saddle would thus have a travel for adjustment of from 5 in. to 6 in. The nose of the saddle at its forward limit would be 3 in. in advance of the vertical line, and set back to its limit, would be about 3 in. behind said line, which adjustment would be found ample for all riders, unless those who, if they cannot find a fault, will make one. Of course, the saddle has the usual vertical adjustment, to suit different lengths of leg. The position of the handles is here shown 3 in. higher than the saddle, and their rear ends are brought back to a line with the saddle nose. This is about as they would be in an ordinary. The rider could sit upright, and manipulate the steering with grace and freedom, whereas he is usually condemned to sit with arched back and twisted neck, in anything but a graceful position, unless, perhaps, in a race, when it is "sit as you please."

Now, it will be noticed that while the saddle has both vertical and horizontal adjustments, the handle bar has adjustment in one direction only—that is, in the direction of the line G H. Makers should set about giving a double adjustment to the handle bar, when they would find the improvement much appreciated.

The diagram (Fig. 3) will show how I propose effecting this desirable end. The steering tube remains unaltered, but the part usually affixed to the handle bar is detached from it, and has, on its upper end, a boss, which is a steel casting made from a pattern. The tube *b* is brazed to this casting. This casting, *d*, has a hole through it to receive the T-piece, *c*, of the handle bar; this T-piece is ⅞ in. thick, same as the tube *b*, which slides in the steering tube *a*. The hole through *d* is 1½ in. long, and the part *c* is 6 in. long, so that it is capable of an adjustment of 4½ in. The handle bar, with its T-piece, is fixed by a set screw through the side of *d*, similar to that fixing *b* in the steering tube. The casting *d* is made so that the hole for the T-piece will have an angle, in relation to the part *b*, the same as the angle of steering post or the line G H in Fig. 2; so that the handle bar, with its T-piece, will be level, as shown by the line in Fig. 2, so that in adjusting the handles horizontally the height will not be altered.

Fig. 3.

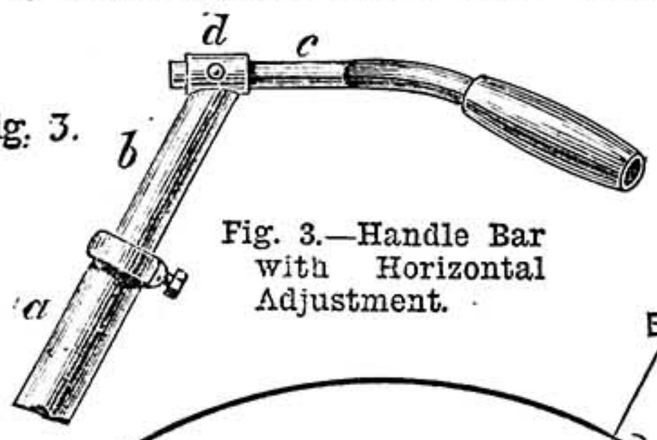


Fig. 3.—Handle Bar with Horizontal Adjustment.

This double adjustment of the handle bar involves some alterations of the brake work, but that is a matter that is easily overcome by the clever mechanic.

By a reference to the machine illustrated in the first of these papers, it will be noticed that the handle bar has not this horizontal adjustment. I have shown it here because I consider it a desirable improvement. It is not a patent; and the mechanic who elects to build his own safety is free to adopt it in preference to the usual pattern, as in Fig. 1 (page 33). The same may be said with regard to the two styles of steering forks mentioned in this paper. The illustrated machine shows curved forks, and the line G H is the centre of said forks (see Fig. 2). So the mechanic, whether he chooses curved or straight forks, will find this diagram (Fig. 2) equally serviceable. In following papers, however, wherein the practical construction of the machine will be described, we will hold strictly by the pattern illustrated (Fig. 1), and let those who choose adopt any suggested improvement upon it.

It will be further noticed that the machine illustrated has the ordinary solid tyres, notwithstanding the present rage for pneumatic and cushion tyres. To believe the advocates of, and especially the dealers in, these tyres, one would imagine that a solid tyred machine would be unsaleable immediately.

The pneumatic tyre is made from thin rubber, and filled with compressed air. When blown up, it may be from 2 in. to 2½ in. in diameter, and is certainly not elegant in appearance. It is, without doubt, better than the solid tyre for comfort and easy running, but it is so liable to accident that I cannot but think it will not hold the field for long. Cushion tyres are made from 1 in. to 1½ in. diameter. They have a hole cored out throughout their whole length. This lightens them, and gives them greater elasticity. They are said to be a great improvement over the solid tyre. Personally, I have not tried them, and cannot speak with confidence of their advantages or otherwise. They have, at any rate, caused a revolution in the making of the materials for bicycle construction, as special rims have got to be made for them, wider fork crowns, and flatter and broader mud-guards. The brake spoon has also to be carefully made and adjusted, else it will cut the tyre, which is simply a hollow tube. They have to be made of the best rubber; hence the price is high, and a deterrent to those with a limited purse.

The cushion tyre may hold its own alongside of the solid, but I do not think it is

Fig. 2.—Line Diagram showing Handle Bar and Pedal Shaft and Steering Line, with Straight and Curved Forks.

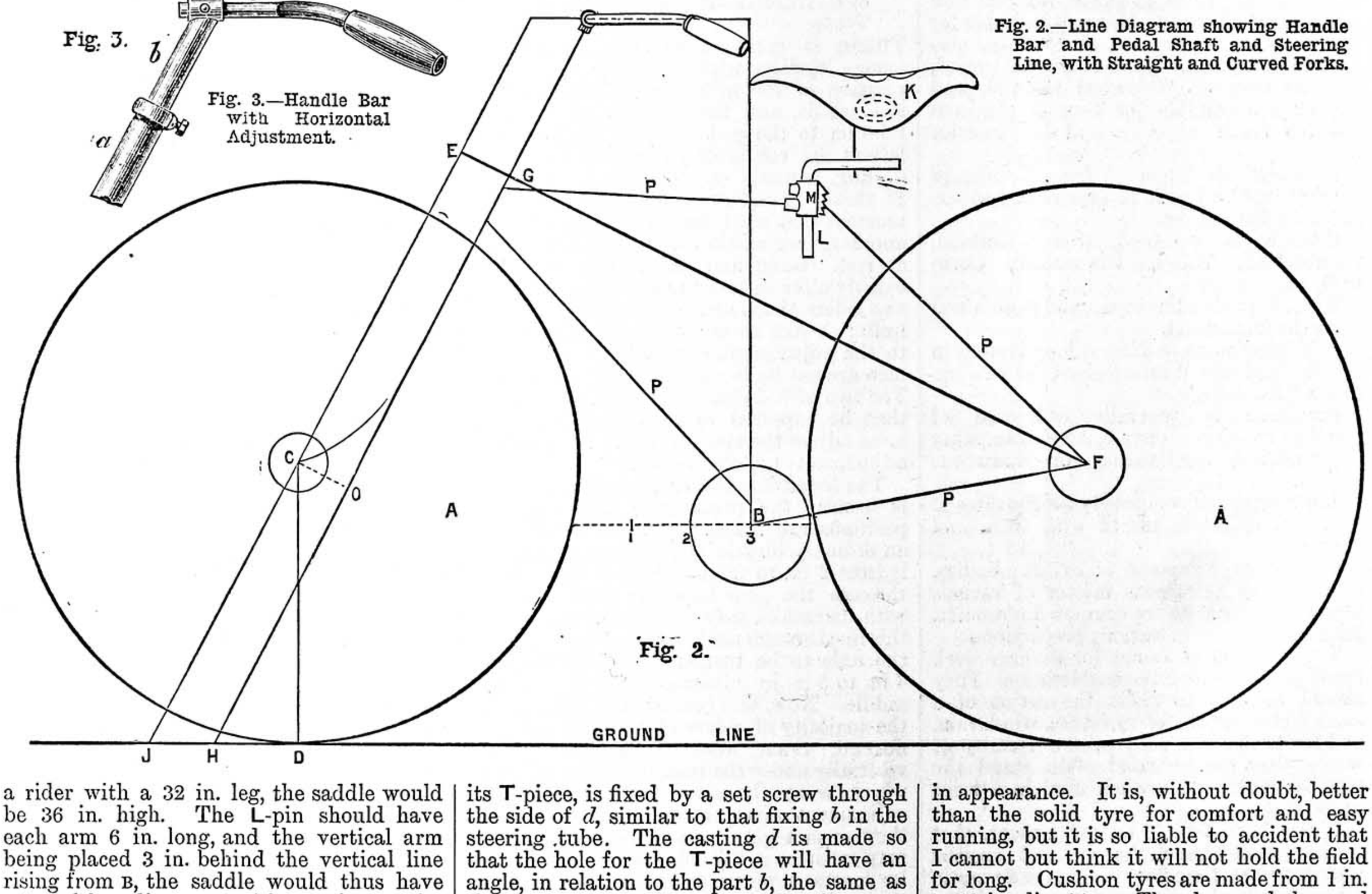


Fig. 2.

likely to supersede it, as a first-class safety, with, say, $\frac{7}{8}$ in. solid tyres of best rubber, is about as good a machine as anybody could desire, and much less likely to get damaged and rendered unserviceable when, perhaps, hundreds of miles from home.

My next paper will deal with the materials required for the bicycle, such as stampings, castings, and patterns for castings, tubes, forks, etc., and where best to procure them, with their prices, according to present lists.

EAR-RINGS AND OTHER ORNAMENTS FOR THE EAR.

PRINCIPALLY WITH REFERENCE TO THEIR MODES OF ATTACHMENT.

BY H. S. GOLDSMITH.

EAR-WIRES OR SLEEPERS—ANCIENT EAR-WIRES—EAR-RING HOOKS—HOOKS AND CATCHES WITH AND WITHOUT JOINTS.

Ear-Wires or Sleepers.—These are the first and simplest form of ear-rings now in use. They are usually made of plain round or facetted—that is, lapped—wire. Fig. 10 B shows the details of the way they are made, although Fig. 10 A is about their usual size.

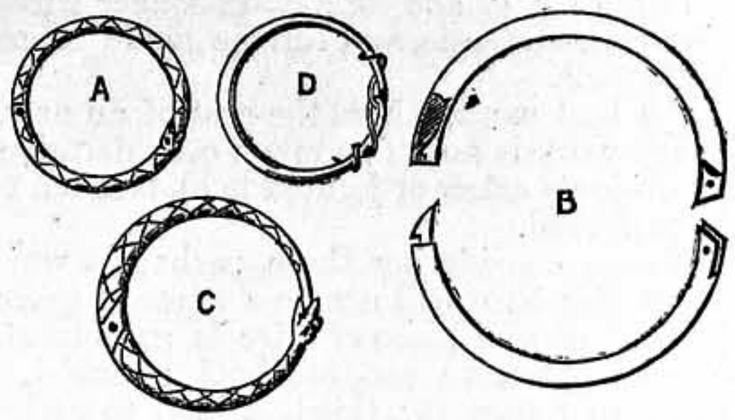


Fig. 10.—Ear-Wires—A, Ear-Wire or Sleeper, ordinary size; B, Details of same, enlarged; C, An improved shape of same in form of Serpent; D, Antique way of making an Ear-Wire.

In these the hardness of the gold itself acts as the spring to keep the catch in its place, and as a rule we find that they are very well and skilfully made, particularly when one considers the very low price they are sold at.

Fig. 10 C is exactly the same sort of thing, but here a more ornamental shape is given to it, and one that is very suitable too: as all our ornamental forms should be. You will notice that it is a serpent, with its tail in its mouth, and it will be, perhaps, just as well if mention is made of the mechanical advantages this shape puts us in possession of.

First, the head is broader and deeper, therefore stronger, and better suited to take the catch. The catch which is rightly formed out of the tapering tail gives us the chance to make it just as thin as we like to have it, for it has to pass through the ear. Now for the joints, which are generally the weakest part of these "sleepers." What have we to say here? Why, that as the body thickens the part where the joint is, we, of course, get greater strength.

Taken as a whole, Fig. 10 C shows thought, and is an excellent example of obtaining all mechanical requirements in a high degree, combined with the other quality that jewellery should possess: namely, be ornamental.

Our friends the ancients managed this class of ear-ring very easily, and strictly correct from an artistic standpoint: at least, so we are taught, for the very merit the material (fine gold) possesses most of—namely, ductility—is here used, as we shall see.

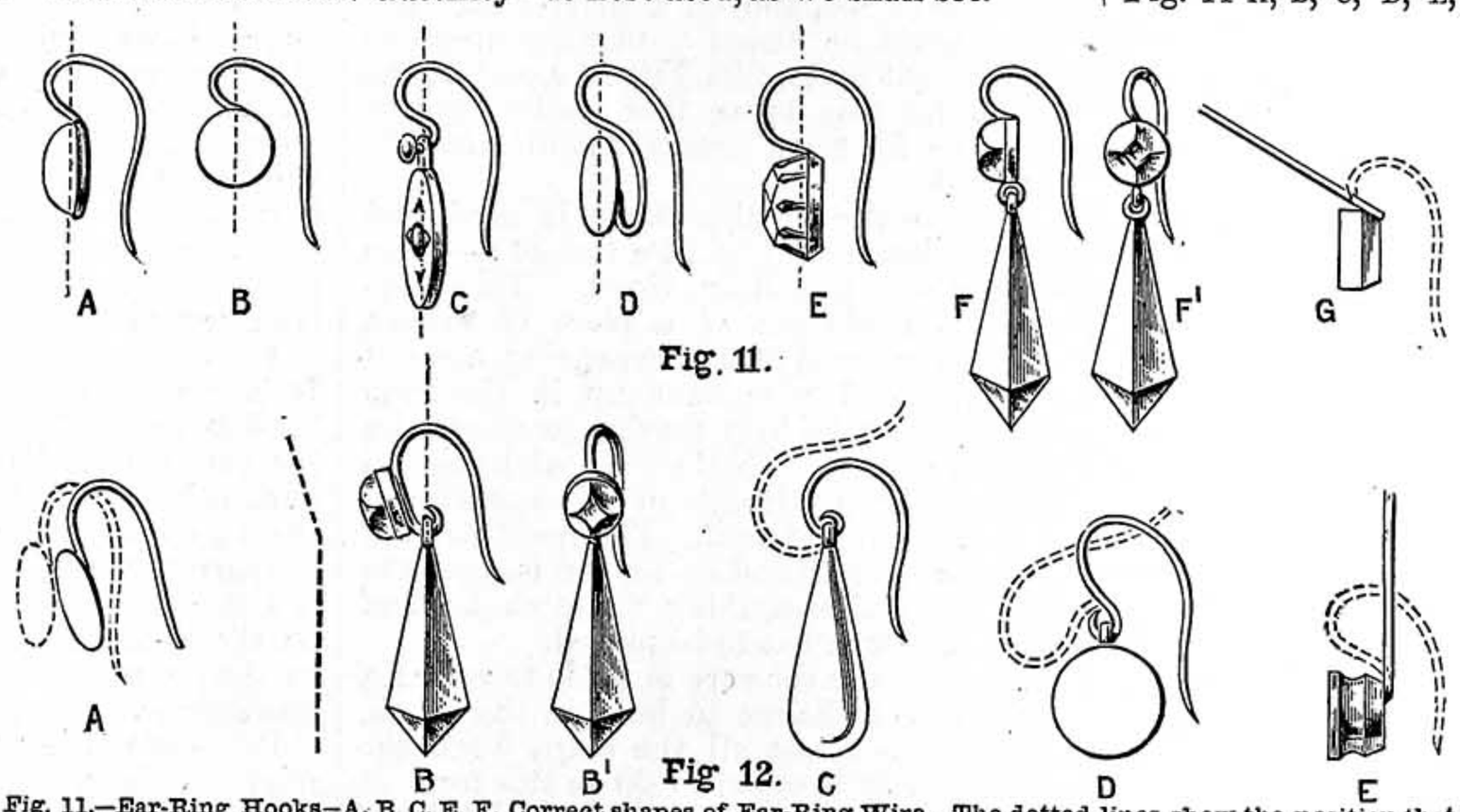


Fig. 11.

Fig. 12.

Fig. 11.—Ear-Ring Hooks—A, B, C, E, F, Correct shapes of Ear-Ring Wire. The dotted lines show the position that the highest part of Wire is to be, and where a line drawn through the Ear-Ring should come. D, Form of Hook to allow of Attachment of Pendant or Drop—at pleasure; G, Correct direction to solder an Ear-Wire to the Ear-top, to be bent as shown by the dotted lines.

Fig. 12.—Ear-Ring Hooks—A, B, B', Incorrect shapes of Ear-Ring Wire, and the results from such shapes; C, D, Ear-Ring Wires without Stops, liable to turn as shown by dotted lines; E, General way of soldering the Wire to an Ear-top, causing the ungraceful bend, as shown by dotted lines.

They are fashioned thus—a plain piece of wire is taken, and both ends are made to taper. Then some sort of a loop is made out of one end, the other end is passed through the ear, then through the loop, and coiled round itself, as shown in Fig. 10 D.

Of course this is the way to employ fine gold, but it would be a clear case of foolishness were we to attempt to make a pair of jointed sleepers in such soft metal.

Such contrasts as these will, it is to be hoped, give rise in my readers' minds, while they are at work, to just this passing thought: "Am I using a suitable quality or suitable alloy of gold for the result I have to obtain?"

Now we know that different qualities of gold are a necessity in our time, each being suitable for some particular purpose. Therefore, will it not be as well to take note of the modification that different alloys bring about—both for their advantages and defects?

There is but little doubt these will be treated on in WORK some day. But meanwhile, take note of all you can in this way, for "notions" picked up and thought out by one's self are the best, for then they do not get forgotten, as facts that are merely read of generally do.

Ear-Ring Hooks.—These, as you see by Fig. 11 A, B, C, D, E, F, G, are simply plain pieces of wire bent up somewhat in a hook-like form. There is some reason in their forms, however, and it is the why and wherefore of the shape that the apprentice should take note of, for on the shape of the wire depends the position of the top of the ear-ring, and may be its safety as well.

Perhaps you have noticed already—or you will after reading this—that nearly all the ear-ring-tops (not ear-studs) worn with and without pendants hang like Fig. 12 A and 12 B—that is, they look downwards, and consequently show a good share of their edges. Now, ear-rings are not generally designed with the idea of showing their edges, but their fronts: and the fronts are made the most ornamental part, in order that they may be seen—at least, that is the way they are fitted into cases; but thanks to the wrong shape of the hook generally, we get the bad result spoken of.

I should often like to take the ear-rings from the ladies' ears and alter them, for it is easy enough. All we have to do to get them to hang properly, is *to make the highest part of the hook in line with the centre or heaviest part of the ear-ring top.*

Dotted lines are in the diagram to show this, but in the workshop we just hang them on a needle-file or a piece of wire, when we see at once if they hang all right.

Even if a pendant is hung from the ear-top, there is not much improvement, for it will hang like Fig. 12 B and B', that

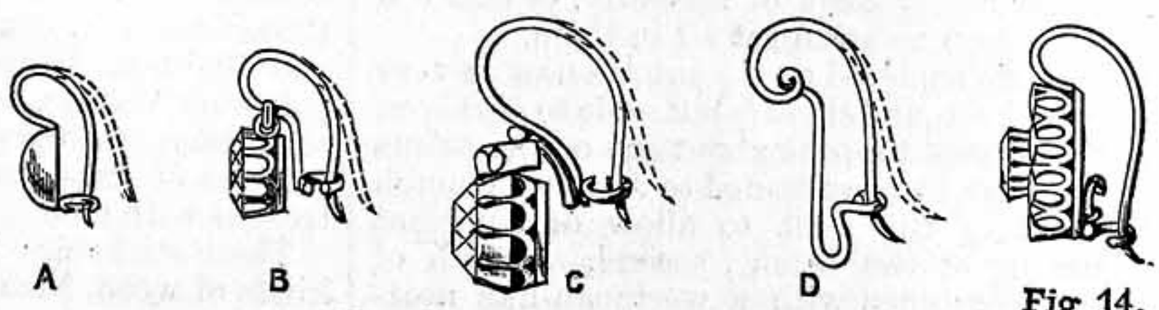


Fig. 13.

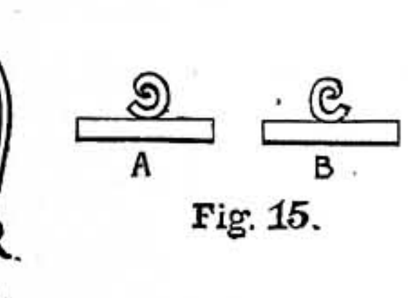


Fig. 15.

Fig. 14.

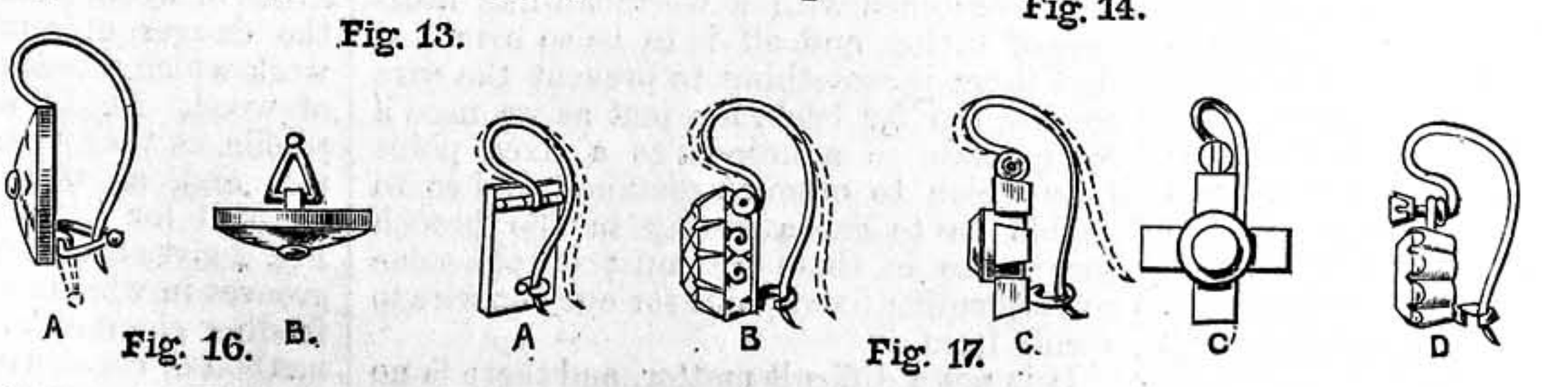


Fig. 16. Fig. 17.

Fig. 13.—A, B, C, D, Fixed Ear-Ring Wires and Catches. The dotted lines give the position the Wire should spring to when released from the catch; B, C, Arranged to allow of a Swinging Collet; D, Simple piece of Wire, forming Ear-Ring Hook and Catch, Ring for a Collet to be attached to, and a loop for the attachment of a Pendant, at pleasure. Fig. 14.—Fixed Ear-Ring Hook with fall-down Catch, the dotted line showing position of Catch when raised. Fig. 15.—A, B, Catches as soldered on Ear-Rings, the opening being on different sides. Fig. 16.—A, Fall-down Loop Catch, the dotted line giving its position when released; B, End view or elevation of same. Fig. 17.—A, B, C, C', D, Different forms of Joints for Ear-Ring Hooks; A, B, Ordinary Chenier Joints; C, Side view of Ball Joint; C', Front view of same; D, Joint formed from Rings.

makes the whole affair just about as straight as a dog's hind leg: not at all like Fig. 11 F and F′, as it should be.

All this points to the necessity of hooks like Fig. 11 A, B, C, D, E, F, G, and it does not matter a little bit whether the hook swings like Fig. 11 C or is a fixed one; we *must* obtain the proper result in all cases, and then our work will look straight out at the world, and not hang its head down as though it were ashamed of the workmen that made it.

All the correct forms, Fig. 11, A to G, are taken from those used in the best work, and for proof of that, if in London, take a walk along Bond Street and Regent Street, where you will see in the best shops dozens of examples of what I am talking about—so it is not a new thing I am writing, but is one of the results obtained by experience, and by those who give thought to their work.

Fig. 11 D is one of the forms of hook that allows the pendant to be removed at pleasure.

Hooks like Fig. 12, C and D, should never be made, as they turn upside down, and if they do get in that position the ear-ring will drop out. They can be made all right by soldering something on them (a grain, or shot, or ring), to prevent them turning over, as shown by the dotted lines. Besides this tendency, there is another to guard against, and that is one in which the wire can get fixed in a reversed position: this is just as bad, to say nothing of having the pendant kinked up all askew.

Before finishing with simple wires, there is just a word to be said about soldering them on to the work. It is this: solder it on in the direction it has to take—that is, forward, like Fig. 11 G—then you will get a prettier curve to your wire than you could obtain by bending it sharp forward. This is only one of the little matters, but it tells in giving style to your work. Fig. 12 E is given to show the way that is *not* recommended. You see that the wire does not look as though it belonged to the top, like the other one, but appears to stand away, and besides, it has an ugly bend where the wire starts curving forward.

Hooks and Catches (with and without joints).—As these are, of course, for ear-rings, the wires must be of a proper shape, and in addition to that they have fittings similar to a brooch; therefore the same principles that apply to brooches must be considered here—at any rate, as far as they concern the soundness and strength of joint, the position of the catch, and the spring of the tongue. I mean, of course, the spring of the ear-wire. On this point the reader is referred to the papers on Brooches in Nos. 41, 46, 49, and 50, Vol. I. of WORK.

Ear-rings with catches are sometimes made without a joint to either hook or catch, and as they are the simplest to look at we will dispose of them first, but they are the most difficult to make act properly.

Fig. 13 A, B, C, D, are all different in shape and arrangement, but all act upon the same principle, which is to get sufficient spring in the wire: first, to hold itself in the catch when it is placed there; second, to spring away far enough on being released from the catch to allow the ear to pass easily between it and the catch. For the latter purpose something over an eighth of an inch is wanted, and to get this distance is no easy matter. The dotted lines show how far the hook should spring back.

Fig. 13 A, being very short, is the most difficult of the four, and after all our hammering and twisting the hook generally has to be bent each time of removal.

Fig. 13 B, C, and D, having longer wires, give better results, and can be made to act fairly well.

For best work, where the cost of an extra hour's work is not of so much consideration, a fall-down catch or jointed hook is much to be preferred.

Before considering these, perhaps a word about Fig. 13 D will not be a waste of space, for out of one piece of wire is ingeniously formed—first, an ear-ring hook; second, a catch to retain it; third, a loop to swing a collet; and fourth, another loop for a pendant or pearl to hang on.

With fall-down catches we get an improvement, inasmuch as the great strain necessary to obtain so much spring is taken away from the wire, and we at once get the necessary space for the ear to pass by simply turning the catch down.

Fig 14 indicates how it is turned down out of the way, and the dotted lines show the position ready for fastening the hook.

The usual C-shape catch is the one most often employed, and on a pair of ear-rings they should be placed with their openings on different sides, like Fig. 15 A and B, the reason for this being that ladies find it easier to fix them from outwards towards the head.

Occasionally another form is used, and this is shown in Fig. 16 A and 16 B—these are the side and front views. This loop-catch is made out of a piece of tubing, which is soldered on to the ear-ring, and out of a piece of wire bent up in the form shown, this wire loop moving as shown by the dotted lines. This form of catch answers all right if the length of the ear-wire is properly adjusted to it. The small grain of gold you see soldered on the top is simply to give the nail something to catch hold of when the catch has to be moved.

In these the ear-wire is made to spring a little, just sufficient to hold in the catch, and that is about all the extra work the ear-ring wire is asked to do in this form of ear-ring, for the first and principal duty of the wire is to hang the ear-ring in the ear.

Now and then an obstinate customer will insist on a catch being added to the lower part of an ear-ring that swings loosely on the top part, and so depriving us of a fixed point for the wire to press against. In such a case we had better use the lyre-shape catch. The shape of this and the way it acts is shown in the paper on Catches of Brooches, and the diagram is Fig. 9 in Vol. I., page 772, of WORK. These will not give you the size and thickness of wire, etc.: that you will have to judge for yourself; but they will appear rather weak of necessity, or else you will obtain no spring at all in them.

Hooks soldered on a joint are now in very general use, and there is but little to say about them except to speak about one or two points that have to be attended to:—First, enough action in the joint to allow of sufficient opening at the catch; second, strength of joint, combined with a workman-like neatness of fitting, and all is to be so arranged that there is something to prevent the wire coming too far back, for just as we used a fly-up plate in a brooch as a fixed point from which to obtain resistance, and so to enable us to get a spring in the brooch tongue, so in these we must obtain some corresponding fixed point for our ear-wire to spring from.

It is not a difficult matter, and there is no need to "lie awake o' nights" to think about it, for we generally carry the ear-wire right round the joint until it touches either the back or the inside of the ear-ring.

The simplest way is shown in Fig. 17 A, and you notice that this ear-wire and all the others are bent after the form previously spoken of, but with this slight difference—that it is just far enough away on the upper part to allow of sufficient opening at the other end, near the catch, when the wire is brought forward.

In the grain-collet ear-ring (Fig. 17 B) the joint is let into the collet; this is for neatness and strength.

If the very top of our ear-ring were of such small size as to reduce the length of our joint too much for a fair amount of strength, then we should use another form—most likely Fig. 17 C and C′, or some adaptation of it. It is, as you see, a ball joint, made as the ball joint for brooches are—out of three flat plates. It is narrow, but strong, and forms, when well made, a very neat and compact joint.

Hitherto we have said nothing of ear-rings formed from two ornaments or two settings—in fact, the last three diagrams show the whole of the fittings soldered on to one piece. If we have to swing a collet we must make a mount to carry the catch, something like the lower part of Fig. 13 B and C. In these, although more irregularly arranged, still we find all the same parts that we have in a brooch, but modified to suit the new conditions, and, as previously written, the arrangement of these joints and catches is subject to the same rules as for a brooch.

Yet another way is shown in Fig. 17 D. It is formed out of rings, with a collet or bead in front. The ear-wire plays through the ring soldered on the drop or pendant until it is to be fastened by the catch, when the two rings jamb, and so give the wire the necessary resistance.

These examples will probably suffice, for on these lines surely anybody will be able to devise something suitable for their requirements.

Pages of writing and dozens of diagrams might be given, but they would be but variations on those already given, so we will stop, and in the next paper we will talk about some other kind of fastening.

A SIMPLE APPLIANCE FOR POLISHING TURNED METAL WORK.

BY OLLA PODRIDA.

THE accompanying cuts illustrate a simple appliance whereby a good finish and high polish may be imparted to turned works between the lathe centres. Tapered or curved works, such as handles, pillars, stanchions, etc., can be treated with facility, and slight modifications in the form of the polishing clamps, or "sticks," as they are sometimes technically called, will enable surfaces of more complicated contour to be treated with ease.

These sticks are best made of the softer kinds of wood, such as pine, so as to avoid the danger of scratching or grooving the work which attends the use of harder kinds of wood. Fig. 1 shows a pair of these in profile, as they would appear all ready for use, and, as will readily be understood, adapted for three different sizes of work. Fig. 2 gives a plan of one-half, showing the grooves in which the work revolves, and the feeding channel at the front sides. The method of construction will be obvious, and detail of same unnecessary, further than that the hinge, although it may be made of metal, is best formed out of a strip of leather nailed over the ends, which must be rounded

as shown in sketch. The grooves for receiving the work must not, when closed together, wholly embrace the subject, but must be so arranged as to leave between the sticks a moderate space — sufficient to apply the polishing material. Fig. 3 will show at a glance what is meant by this, and how it is attained by cutting away the adjacent faces after marking, and cutting or boring the holes to form grooves, which, by the way, if not too large in diameter, may readily be accomplished by clamping the two parts together, and sending a sharp centre-bit through to the marks.

The detail of polishing is simple, and as follows :—After the work has been turned

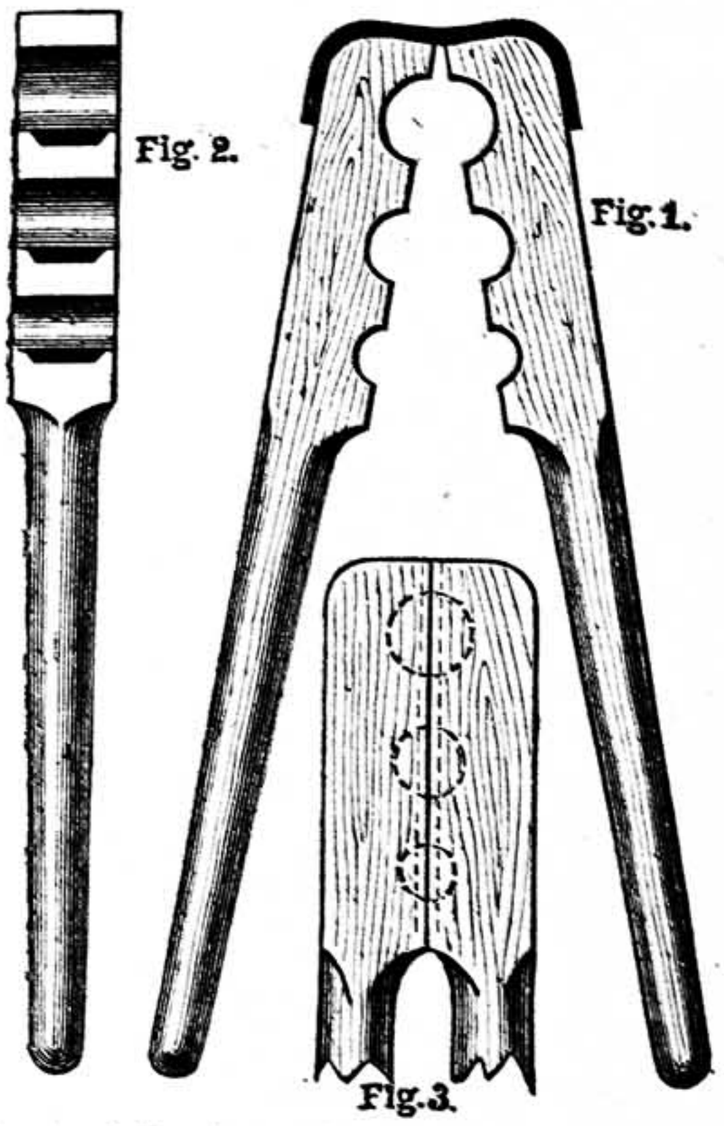


Fig. 1.—A Simple Appliance for polishing Turned Work, shown in Profile as ready for Use. Fig. 2.—Plan of Half showing Grooves and Feeding Channel. Fig. 3.—Mode of cutting Grooves for receiving Work.

and, where necessary, smooth-filed, it is revolved at a good speed in the embrace of the sticks, the feeding channel being kept supplied with emery and oil. If a high polish is desired, it is better to use a second pair, lined with leather in the groove, and kept for fine powder only. To facilitate the maintenance of an even pressure on the work, the handles may be tied together with a piece of cord, and the sticks pushed regularly from one end of the work to the other. This, with a little practice, can easily be accomplished by giving a slight angular movement or advance to the handles in the direction required. The waste emery and oil, or drippings, should be carefully saved for future use, and must not be allowed to accumulate amongst the working parts of the lathe.

AN EASILY-MADE NEST OF PIGEON-HOLES.

BY C. E. MAES.

DESCRIPTION — CAREFULNESS — ARRANGEMENT OF HOLES—THE ORIGINAL MODEL—MATERIAL—TOOLS — SIZE — OUTER CASE — JOINT FOR SHELVES AND PARTITIONS—FORMING GROOVES —FITTING PARTS TOGETHER—SUGGESTIONS FOR ORNAMENTATION.

I SUPPOSE it is not necessary to tell any reader that the pigeon-holes referred to have no connection with Columbarian pursuits. If it is, let me say that the pigeon fancier will not find anything to interest him in this article. By telling him this at the outset he will not be disappointed when he finds, after having read it through, that pigeon-holes—or, to express the thing more correctly in technical parlance, a nest of pigeon-holes—are for keeping letters and other documents in. Of course, there are various kinds of contrivances for this purpose, and on looking at the illustration of the "nest"—strange how the idea of ornithology sticks to this little piece of furniture, is it not?—possibly some experienced wood workers may be inclined to turn up their noses at it. They will find this a more difficult operation than making the pigeon-holes; but if they will be kind enough to remember that a novice at wood working would find this latter equally difficult of accomplishment without directions, they will, if not inclined to welcome these, at least look on them with tolerance.

There is a beginning to everything, and the beginners at WORK must be helped forward as well as the more advanced. This remark, of course, is for the minority—doubtless a small one—of readers who are so unreasonable as to think or wish that their own requirements should be specially catered for in a magazine which caters for all.

Simple though the construction of these pigeon-holes may be, it will yet afford useful exercise to the tyro; and when it is made, no doubt he or some of his friends will be able to find a satisfactory use for it. If he succeeds in making it neatly and well, he may in time to come be able to regard it with pleasure as an early effort.

I may here say that, because it is simple, it will be a mistake for the beginner not to use as much care over its construction as he can. Careless work never achieved anything worth noticing, and the novice is too often discouraged by attempting to make something altogether beyond his powers. Let him proceed slowly and carefully from simple construction to more complicated contrivances, and he will find that his skill increases almost insensibly till, in the no distant future, he finds that he is able to accomplish anything in reason connected with the craft he has taken up, either for a pastime or as a business.

We all know Carlyle's definition of genius, and, without going too closely into it as of general application, there is no doubt that the cleverest and most skilful artisan—I won't call him a genius—is the one who takes the most pains with his work, whether it be great or small. He is, in fact, the one who obeys the injunction, "Whatsoever thy hand findeth to do, do it with thy might"—given, by the way, was it not, by a tradesman or artisan who might be supposed to know what is necessary in the way of good advice to hand as well as head workers?

Now, after these prefatory remarks, given by way of encouragement to beginners, and perhaps a little bit by way of apology to more advanced workers, let us see about making the nest.

In its primitive simplicity, it consists of an oblong box with an open front. It has two shelves, with a series of upright divisions, by which means the "pigeon-holes" are formed.

As the English alphabet consists of twenty-six letters, we may reasonably suppose that a nest containing about that number of holes will be the most generally convenient. The illustration shows the rows of holes, but it might as well have been four, or, in fact, any number; but as three into twenty-six won't go—I think that is the way that it was expressed when "we were boys together"—without leaving a hiatus somewhere, we just make three rows of nine holes each, being twenty-seven in all, or one more than the alphabet requires. It will come in handy for some purpose or other, so that we need not object to its existence. Special papers which it is desired to have separate may be kept in it, and, indeed, one or two more holes may be reserved for the same purpose; for it will be an unusual lot of correspondence which has many or an equal number of papers beginning with the same letters of the alphabet. As a suggestion, the X Y Z letters may be put in one pigeon-hole, without much difficulty arising when a particular document is wanted.

However, if the directions for making one set of pigeon-holes can be carried out, the veriest duffer can have no difficulty in making his own arrangement.

Perhaps it may lend additional interest to the nest, which forms the basis of this article, to say that it is in the editorial room of WORK, and that in it are accumulated the letters which are continually arriving for answer in "Shop," as well as others for the consideration of the Editor.

Of course, such a mass of correspondence requires a much larger nest than would be required for private purposes, and I have therefore taken the liberty of altering the dimensions of the original to those which are more likely to be generally useful. Those who do not like them can alter them to suit their own wishes.

What kind of wood are they made of? This is naturally a question which the beginner will ask, and very probably he takes sufficient interest in WORK, and all that pertains thereto, to wish to make his like the original one referred to, or, at any rate, of similar material. Now, from what I can gather, an editor's apartment is popularly supposed to be fitted up in a style of luxury and with a beauty of appointment which the humble reader cannot hope to aspire to: and of course, on this supposition, the editorial pigeon-holes are made of—well, let us say a choice and costly wood. I fancy I hear some one with the bump of curiosity largely developed say, "Why can't he tell us exactly what it is?" Well, my brethren—or, if you like it better, my fellow admirers of WORK—the reason is just this: On one occasion, shortly before I was asked to write on a particular subject, I was taught to be cautious. I was not sufficiently so when I got pen in hand and paper before me. That MS. was not published, and I got a "wigging" from the presiding genius. I do not wish to incur the mildest of mild rebukes from "our" Editor, so it must be sufficient to say that pine may be used instead of a choicer wood by the novice who essays to make the present pigeon-holes.

Although pine is a common wood, there is no reason why it should be bad of its kind. A nice clean piece—by which I mean that it should be free from knots and shakes or cracks—will work up admirably. It should also be dry, and in order to ensure its being so, it may as well be kept in the kitchen or a warm, dry room before it is used. Wood is often seasoned thoroughly, but not be quite so dry as it might be when it is first brought in from the timber yard, where it has very likely been exposed, more or less, to the changeable atmosphere of our climate. Do not, in any case, attempt to

dry it too quickly by the fire, or the results will not be satisfactory, and may possibly necessitate the expenditure of more money at the timber yard.

One of the first points to be decided on is the thickness of the material. The job will look better if the outer case is thicker than the shelves and partitions, but this is not a matter of importance. As very thin wood is not as easy to work up as comparatively thick stuff, we may take it as being about ⅜ in. thick for all portions. If two thicknesses be decided on, let the case be, say, ½ in. thick. Of course it may be much more, and may be less, if the maker has any wood lying by him that he can use for the purpose. Strength is, however, amply secured by the thickness named, and might be so even if it were less.

The depth from back to front being comparatively unimportant, let us assume that it is just the width of the board from which the job is to be made. As the wood will probably have an irregular edge, it must be set out from the narrowest part, and this, we may assume, will not be less than 9 in.

After the wood is planed smooth, the only tools absolutely necessary will be the square, a bradawl, a screwdriver or hammer (according to screws or plain nails being used), and a chisel of not greater width than the thickness of the wood forming the upright partitions. Even if the tools have to be bought specially, this will not involve a great outlay; it will be less than the cost of making the article, and, as the tools remain for future use, they may be considered, from a pecuniary point of view, a gain, or as representing profit—not in cash, of course, but in stock.

First of all, in making, with the aid of the square cut off two pieces of the board 27 in. long, and two pieces 1 ft. long each. These will form the top, bottom, and ends of case, and will be nailed together. The great consideration, of course, must be that opposite pieces are exactly of the same size, and that all the edges are square. If a piece is wider than the one opposite to it, or is wider at the front than at the back, or *vice versâ*, then a good square case is out of the question; for it is an impossibility to make a perfectly rectangular box if all the parts are not regular. With care, there will be no great difficulty in getting them so.

It is suggested that the top and bottom are to be nailed on to the ends, though whether this or the alternative of fastening the ends to the top and bottom be adopted is not a matter of vital importance. Those who can do so may prefer to fasten the parts together with dovetails, but as this presumes the maker to be possessed of more skill than those I am specially writing for, no detailed directions need be given.

The case being ready, the shelves will be cut to fit tightly within the ends. They will, of course, be the same width as the top and bottom, and should be cut with perfectly square corners. When they are cut, do not fasten them in at once, but wait till the partitions are ready and the grooves cut for their reception. The joint for the shelves and the partitions is shown on an enlarged scale in Fig. 2. From this it will be seen that the edge of the partition is sunk in a groove cut for it in the shelf.

This form of construction may not be the strongest possible, but as it is strong enough, nothing more can be required.

The width of the grooves is just enough to allow of the partitions fitting tightly into them, and their depth in proportion to the thickness of the shelves is sufficiently shown in Fig. 2.

To mark and cut these grooves is an easy matter, but it must not be done haphazard. At equal distances from each other, mark out the position for the divisions, either with compasses or by other convenient means, remembering that at the ends of the shelves the spaces must be shorter by half the thickness of the partitions than the others. The reason for this is so obvious that nothing need be said about it.

The places for the partitions being ascertained, with the square draw lines across, representing the width of the grooves; then cut these lines down to a uniform depth with the chisel, cutting downwards, or, guided by a straight-edge, draw it along so that it cuts into the wood. If the cut is not deep enough, it can easily be made so by repeating the operation as the waste wood is removed. This can be managed with the narrow chisel already referred to as one of the necessary tools for making the job with. The cuts at the sides of the grooves allow the wood between them to be removed without disturbing the surfaces of the shelves. The bottom of the grooves need not be made absolutely smooth, as they are not seen when the parts are fitted together, and a finicking amount of finish is not necessary, for the work will be just as strong and substantial without it.

All the grooves being ready, the shelves may be fitted in their places and the upright partitions be forced in. The grooves will hold those between the shelves, while those above the top and below the bottom shelf will be held partly by the grooves and partly by a few nails through the top and bottom. It only remains to fasten thin wood on the back, and our nest of pigeon-holes may be considered complete. It will naturally occur to the user to mark each hole with a letter of the alphabet, according to the documents it is intended to hold, but certain easily effected ornamental details may not so readily suggest themselves without a hint or two.

An excellent finish, relieving the stiff, straight lines, may be easily formed by putting thin pieces of wood at the top of each hole. They are decidedly ornamental, and anyone who has a fret saw will have no difficulty in doing what is necessary. By way of suggestion, two appropriately shaped pieces are shown in position in Figs. 3 and 4. The pieces, of course, are fastened by small blocks of wood glued in behind them.

In Fig. 5 is shown a really handsome-looking nest of pigeon-holes, and yet it is virtually the same as the one which has been described.

The ends are thicker, and their front edges are beaded with the "scratch," a tool which has been so fully described in WORK already that further remarks about it would be out of place. The top edge is merely a piece of ordinary pine moulding, such as can be got in any large town from those who supply builders with them. The bottom is thickened up and the appearance of moulding given to it by three pieces of stuff, 1 in. thick and, say, 2 in. wide, being fastened on to the bottom board by means of screws driven through from below.

The front piece should be the whole length of the job and the end pieces shouldered up behind it, so that they need not be mitred at the corners.

If these end pieces are cut off across the grain of the wood, instead of with it, they will be better; but on a job of this kind attention to this is not of the greatest importance.

The edges can easily be rounded off, as shown, with the plane, and finished with glass-paper.

With the remark that the job, when made, may be stained and polished or painted, according to fancy, these directions and suggestions must be brought to an end.

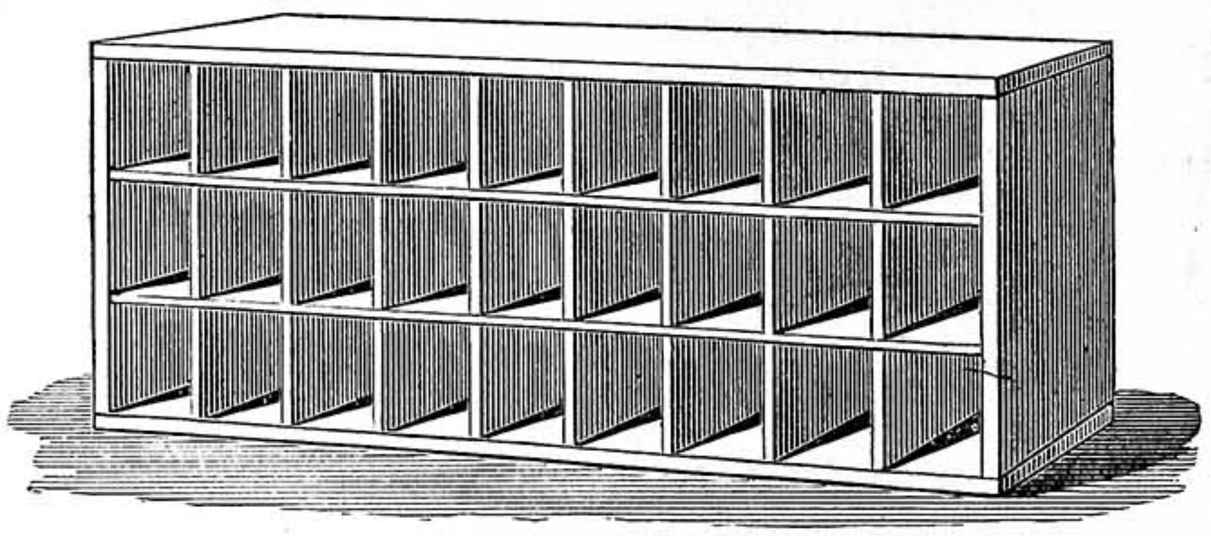


Fig. 1.—Nest of Pigeon-Holes: Plain.

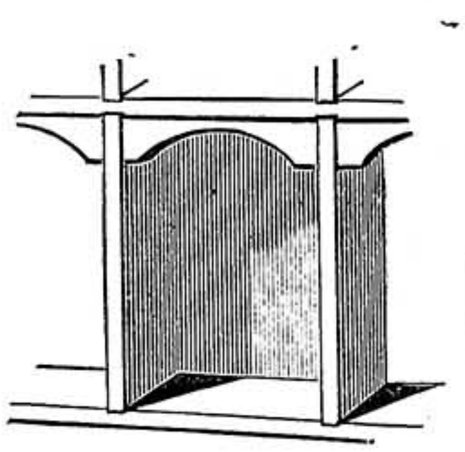


Fig. 3.—Bracket at Top of Pigeon-Holes.

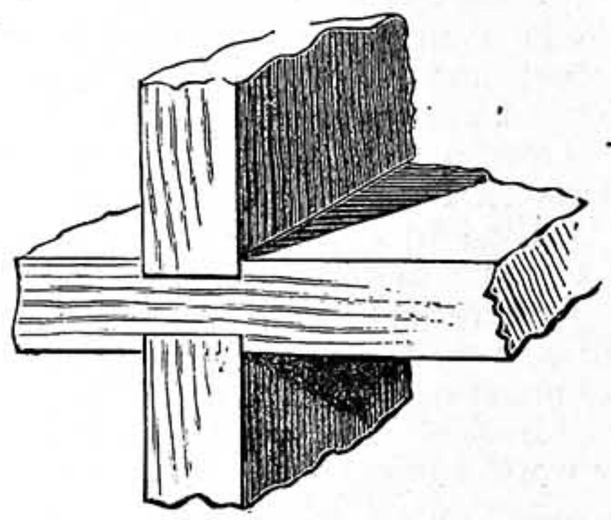


Fig. 2.—Connection of Partitions and Shelves.

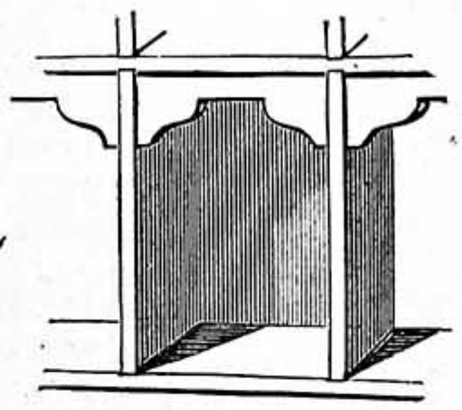


Fig. 4.—Alternative Form of Bracket.

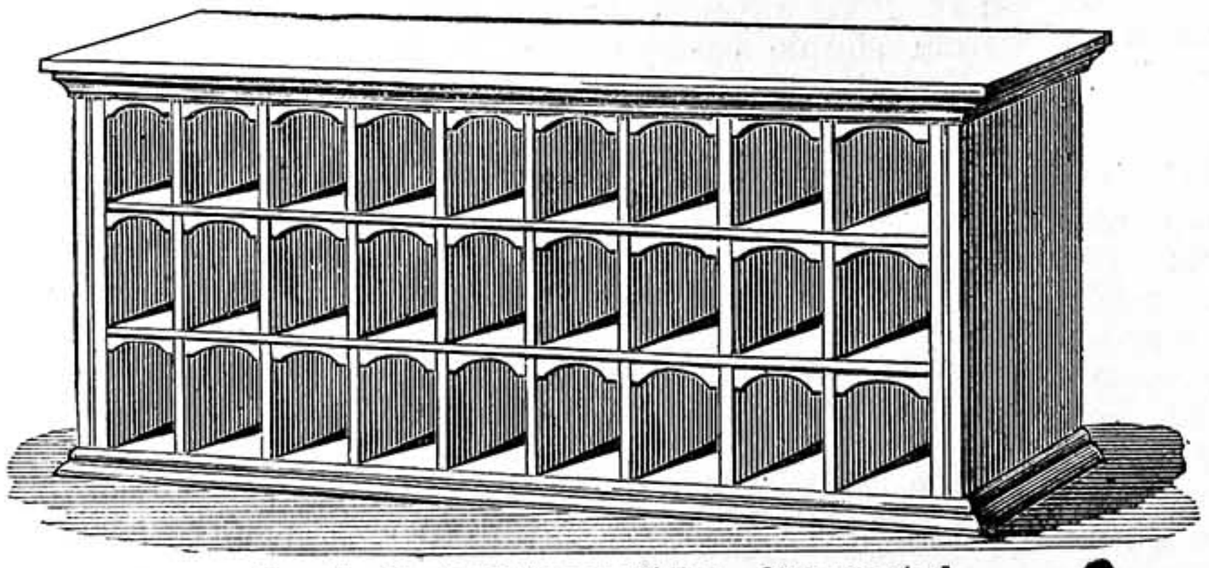


Fig. 5.—Nest of Pigeon-Holes: Ornamented.

HINTS ON MECHANICAL DRAWING FOR TEACHERS.

BY H. A. MILES.

PREPARATION OF WALL DIAGRAMS—POINTS TO BE KEPT IN VIEW—DRAWING-BOARD—SIZE RECOMMENDED — METHOD OF CONSTRUCTION — TESTING ACCURACY—ARRANGEMENT FOR TAKING CONTINUOUS PAPER WITHOUT FOLDING—T-SQUARES—INSTRUMENTS—RULING PENS UNSUITABLE—HOW THEY MAY BE ADAPTED TO RULING THICK LINES — MOST SUITABLE BREADTH FOR LINES—PARTS IN SECTION—COLOUR *v.* LINES—DRAWING LARGE CIRCLES—SIMPLE BEAM COMPASSES—SHADING CIRCLES—PERRY'S PEN FOR LETTERS AND FIGURES—BEST SIZE FOR SAME—USE OF STENCIL PLATES—INSERTING DIMENSIONS—WOLFF'S CHINESE INK — HOW TO INK IN LARGE DRAWINGS—CLEANING UP—MECHANICAL DRAWINGS AND THEIR DISADVANTAGES—SHOULD BE SUPPLEMENTED BY PERSPECTIVE OR ISOMETRICAL PICTURES.

How often has the reader wanted to make an illustration which has to be looked at from a distance? For example, a banner is required for the Sunday School, a large illuminated text for the walls, or, in the case of either a school or science teacher, a wall diagram is required to illustrate some portion of a lecture.

As a teacher of machine construction and drawing, etc., I have had to prepare a large number of such diagrams for class demonstration, and have at the present time over a hundred illustrations of machine and engine details, all prepared in the way I shall now describe.

To prepare a drawing, every detail of which must be perfectly distinct in the furthest corner of the class-room, requires, of course, a special method of treatment, and experience only can enable the draughtsman to judge what will be the best scale to draw to, so that while every portion shall be easily understood, no part is wastefully large. It is best, in some cases, to treat the very small details separately on a larger scale.

I do not in this paper propose to *teach* anyone mechanical drawing, but merely to explain the various methods by which I have overcome the many little difficulties continually cropping up, and assist others by bringing to their notice some of my own dodges for saving time or labour.

The drawing-board is, of course, the first consideration, and that which I have found best is a pine board 5 ft. by 3 ft., this size taking antiquarian or continuous paper.

It should be constructed as follows: The grain should run lengthways of the board, which should be of ¾ in. even-grained pine, entirely free from knots; when glued and joined, the boards should be clamped up tight and left till dry—at least twelve hours. Both sides should then be evenly planed, and one edge shot up true and marked. The two ends and the other side may now be trued up from the first, and a final check on its accuracy taken by measuring it across diagonally from corner to corner, when, if both diagonals are equal, the board will be square. This test does not prove that the sides are straight, but the eye run along the edge will detect any inaccuracy. The best surface should be decided upon, and marked. The other must now be grooved with a plough plane at intervals of 3 in. or 4 in., the grooves being ¼ in. wide, and deep enough to leave a thickness of ¼ in. The warping and shrinking properties of the board are now practically reduced to one only ¼ in. thick, and made in widths of 3 in. or 4 in.

At least three battens, for the purpose of strengthening the board, will be required, and two of them must be about 6 in. longer than the narrow width of the board, for a purpose I shall presently explain. One of these must be fastened at each end, and the other in the middle of the board, as shown in Fig. 1. These battens must be fixed in a certain way, or the board will twist.

Each should be screwed in the centre, and all other screws necessary must be placed in longitudinal slots, as shown, thus allowing for expansion and contraction due to atmospheric influences. The board is now completed as far as ordinary work requires, but if continuous paper is to be used, a slight addition, designed by the author, will be required.

2¾ HP NOMINAL

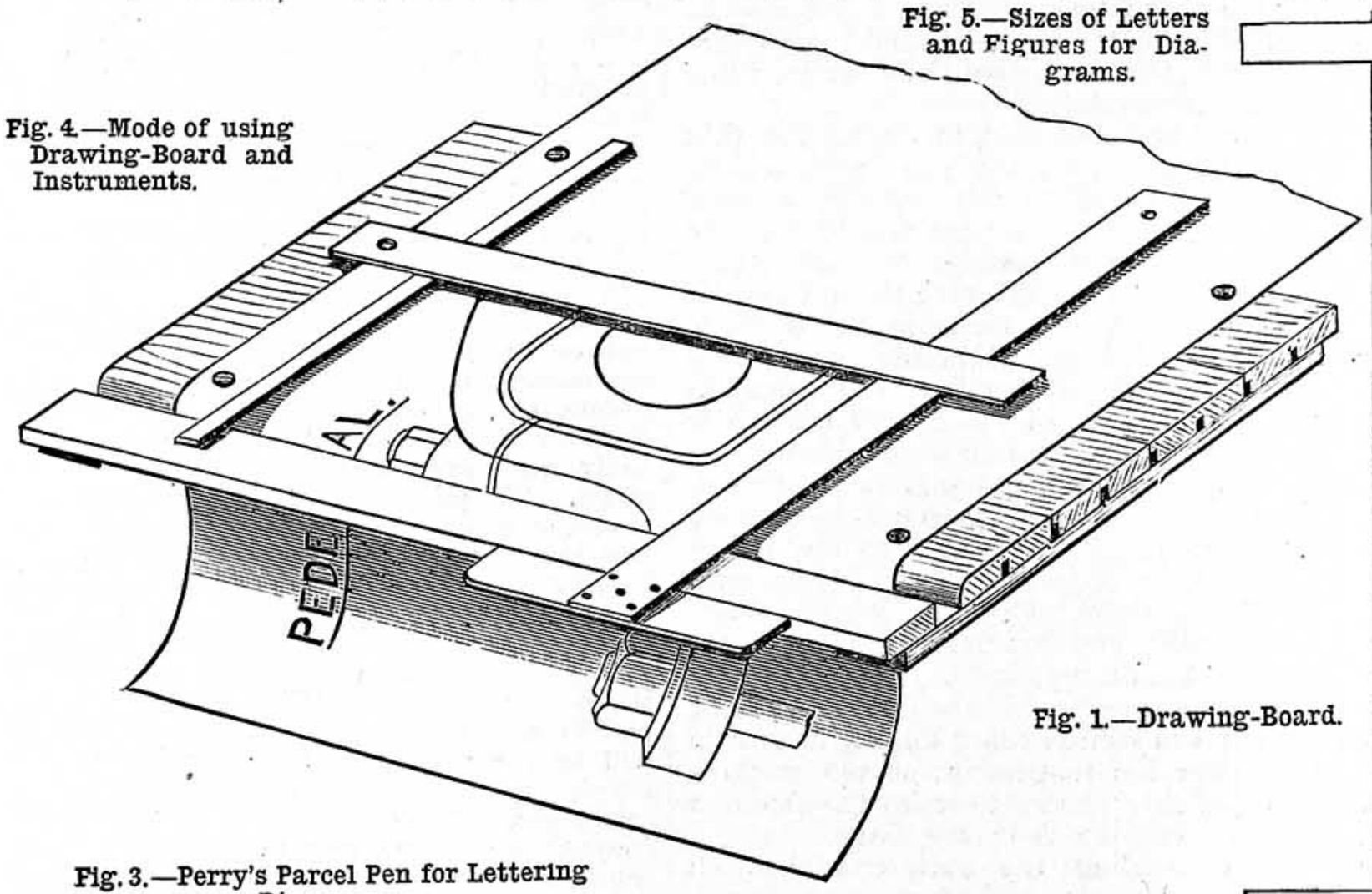


Fig. 4.—Mode of using Drawing-Board and Instruments.

Fig. 5.—Sizes of Letters and Figures for Diagrams.

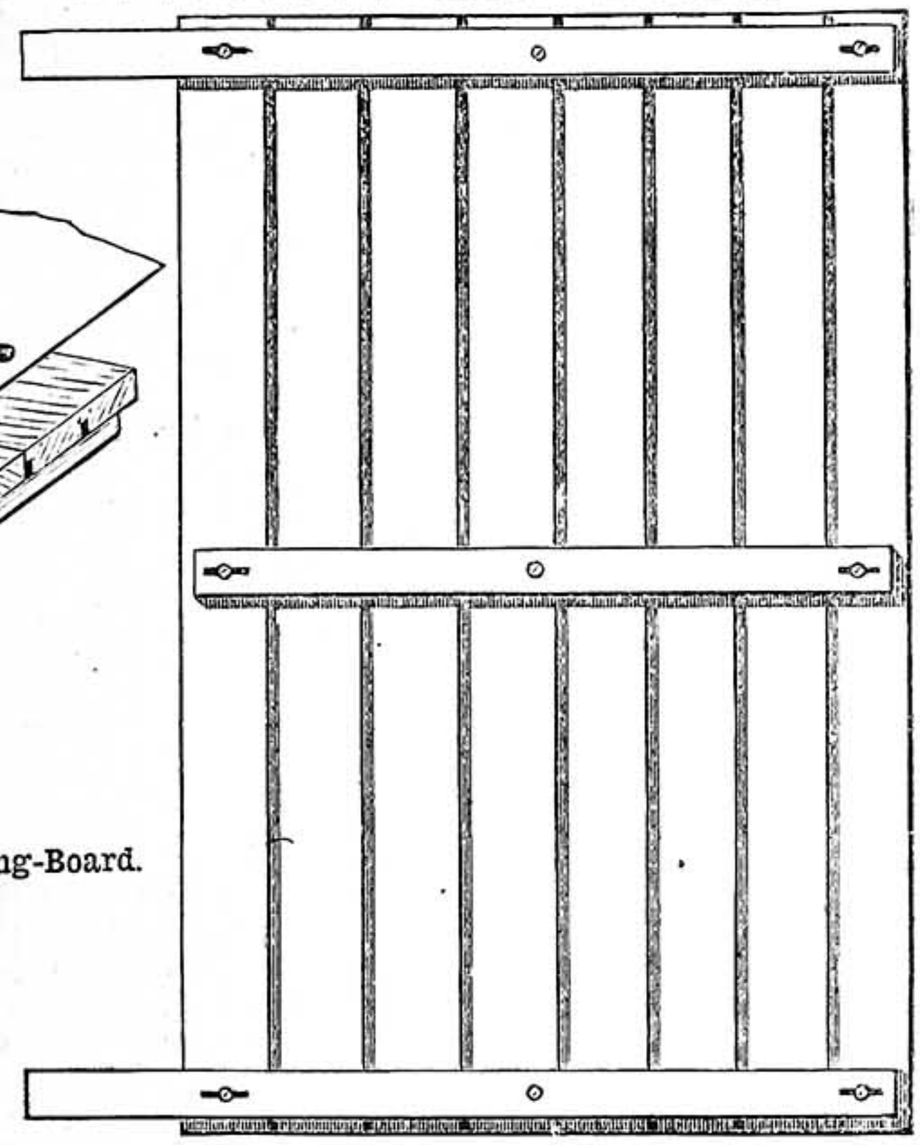


Fig. 1.—Drawing-Board.

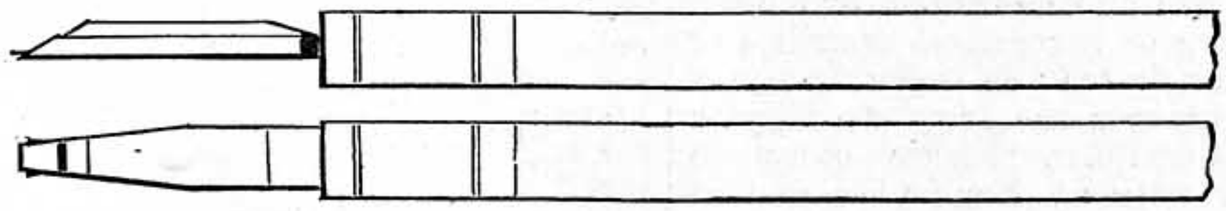


Fig. 3.—Perry's Parcel Pen for Lettering Diagrams.

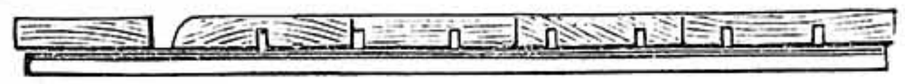


Fig. 2.—End or Sectional View of Drawing-Board.

Take a strip of close, straight-grained mahogany, 5 ft. long, about 4 in. wide and ¾ in. thick, and plane it up accurately, with the sides perfectly parallel. This piece is now to be screwed to the two end battens in such a way that a gap about ½ in. wide is left between itself and the edge of the board, which is rounded off. The completed part of a drawing on continuous paper may be slipped down this opening, and a fresh surface exposed to the draughtsman, while the T-square always has a guide to work against, and no folds need be made in the paper, as shown in Fig. 4.

T-squares of pear wood are cheapest, and two will be required—one for each way of the board. The blades, which should be screwed to the stock, should be parallel, and not taper, as, owing to the size of the board, it is often necessary, especially when working at night, to use both sides of the blade in order to avoid shadows.

With regard to instruments, the ordinary

ruling pen will be found of but little use, the lines being almost invisible a few feet away, and much labour is entailed by ruling double lines and filling up the intervening space by a brush; while the brush alone is unsatisfactory in every way.

A simple yet wonderfully efficient dodge was thought of by the writer to surmount this difficulty.

A piece of fine linen is folded so as to present a nice blunt point, and is then placed between the jaws of the ruling pen, and the screw tightened, the waste material on either side being removed by a sharp knife. The pen may be supplied by means of an ordinary writing pen, or itself dipped into the ink direct. The first few strokes will be rather too fine, but the point rapidly widens to the full extent of the opening between the jaws, and a splendidly even line will then be obtained. The ink is held in reserve very effectively, only just sufficient being allowed to pass to the paper. The best thickness of the lines varies from $\frac{1}{16}$ in. for internal details to $\frac{1}{8}$ in. for outlines. Sectional shading may be done with this pen, but a darker wash of colour should be used in preference to lines, as the latter seriously interfere with the clearness of any dimensions which it may afterwards be necessary to insert. The pen joint of the ordinary compass may be treated in a precisely similar manner.

It frequently happens, however, that a circle is required which is too large to be described with these compasses, and the following plan may then be adopted as a cheap substitute for beam compasses—

Take a thin strip of wood, about $\frac{5}{8}$ in. by $\frac{1}{8}$ in., and fit the compass pen into a hole at one end. A pin passed through a fine hole and driven a short distance into the board will form the centre, and the circle can then be readily described, the bar being left long enough to accommodate itself to various-sized circles.

By the way, while speaking of circles, it sometimes happens that in a shaded drawing one side of a circle is required to be thicker than the other, and it is a very difficult operation to successfully accomplish. If, however, the centre be very slightly shifted towards the side in shadow, and the half circle again struck with the same radius, the effect will be perfect, the line gradually increasing in thickness, and as gradually merging again into the ordinary size.

For lettering, the best pen is Perry's parcel pen, shown in Fig. 3. It can be obtained in several widths, and engrossing or block lettering can be very effectively performed by its use. Some little practice is necessary, but if the pen be pointed outwards, as if writing with a "J" pen, very little difficulty will be experienced.

The most useful size for letters and figures is $\frac{3}{4}$ in. for important words and $\frac{5}{8}$ in. for ordinary lettering, such as names of engine or machine details. Figures should be $\frac{7}{8}$ in. for whole numbers, and $\frac{5}{8}$ in. for fractions.

For economy of space fractions are best inserted thus, 7/8 in., rather than $\frac{7}{8}$ in.

Stencil plates are very useful, but require to be specially cut, as the ordinary Roman letters are unsuitable. The form most useful are oblong block letters, a specimen of which, with figures, is shown full size in Fig. 5.

All lettering and dimensions should, however, be left till the very last, after all colouring is perfectly dry.

The best ink to use is Wolff's liquid Chinese ink, which is of a dense black, and for ordinary work will bear 50% of water being added to it. This ink is especially suitable if the drawing is to be coloured, as when once dried, it is impossible to wash it up, even after prolonged saturation. For inking in, a flat ruler with a bevelled edge will be necessary, also a couple of strips of wood, about $\frac{5}{8}$ in. by $\frac{1}{8}$ in.; these and the straight-edge may be about 3 ft. long. The method of using them will appear further on.

It will now, perhaps, be advisable to follow the course of a drawing through all its stages before colouring is touched upon.

The board being placed at a height suitable to the draughtsman, the paper is placed on it, and fastened with a drawing-pin at each corner, first setting the paper square with the sides of the board. The usual method of procedure is then followed with regard to centre lines, etc., etc., until the drawing is completed in pencil.

All circles or arcs of circles must now be inked in, the pen being filled up as before described. The two thin strips of wood may now be placed across the drawing so as not to rest on any wet lines, and used as supports for the straight-edge. These strips may be shifted as necessity occurs, and the entire drawing inked in without any delays, while certain portions dry.

It will be found best to do all the thin lines first, and as the pen point widens with use, to insert the broader outlines. All lines in one direction should be done at once, as far as possible. The strips may then be placed parallel with them, the ruler laid across it, and those in the opposite direction filled in. Dimensions may now be inserted, the dotted lines being done in red, arrow-heads in black, and the whole drawing cleaned up with indiarubber.

If, however, the drawing is to be coloured, the paper must, previous to use, be damped and fastened by its edges to the board, narrow strips of gummed paper being useful for this purpose. Ordinary water colours are suitable, and brushes according to the fancy of the draughtsman.

All colouring should be as light as possible, the parts in section being slightly deeper in tone than the remainder; curved surfaces may be lightly shaded to assist the students in understanding their true shape.

In concluding, the author advises all teachers of mechanical drawings to supplement their plans and elevations by models and perspective or isometrical drawings of the details illustrated; as every first year student experiences the greatest difficulty in understanding the construction of a piece of machinery until he has had a certain amount of practice in reading mechanical drawings. If this method is followed, the results will amply pay for the extra trouble involved.

OUR GUIDE TO GOOD THINGS.

*** *Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of* WORK *for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of anyone who has a useful article for sale to obtain mention of it in this department of* WORK *without charge, the notices given partake in no way of the nature of advertisements.*

12.—HART'S CANTILEVER BOWL CASTOR.

I THINK all readers of WORK will agree with me in condemning the old-fashioned ordinary form of castor—or caster, for both modes of spelling the word are used, and I venture to think the latter preferable—in which the axis on which the wheel of the castor worked went through the ends of a couple of pieces of brass, proceeding from a socket revolving on a pin issuing from the bottom of the cup of the castor; an arrangement which tended to throw the wheel right out of, and away from, the direct line of pressure, passing down the centre of any table leg or chair leg, which was perpendicular to the plane of the floor. It was a weak form of castor, liable, if badly made, to get quickly out of good working order, and many varieties have been introduced which have been, to a greater or less extent, improvements upon it. The latest with which I am acquainted is Hart's Cantilever Bowl Castor, figured in the accompanying illustration, a prospectus of which has been sent me by Mr. A. Marmaduke Hart, Vicarage Park, Plumstead Common, S.E. To judge from the illustration and description it seems to be an excellent form of castor, for the reason mentioned above; but I can say no more than this, as I have received no samples which I might put to a practical test. I append Mr. Hart's description of the castor, and from this and the illustration my readers will have as good means of forming their opinion of the article as I have as yet had.

Hart's Cantilever Bowl Castor.

Mr. Hart claims that the Cantilever Bowl Castor is "the most perfect castor for furniture, etc., ever invented, combining all the advantages of all other castors, equal to central action without the disadvantages, cannot get out of order, perfectly noiseless and free in action, no side strain. The principle briefly stated is, that the cradle, or holder, forms an unequal-sided triangle or pyramid, the base being divided into unequal lengths by the central pin, the bowl being at the apex slightly out of the centre. By means of the cantilevers the balance is readjusted, and makes the bowl equal to being in the centre of the castor; also the cantilevers overcome any resistance. The arrangement is so simple that it will be easily understood on reference to the drawing. The principle of construction is a sound one. For chair and couch work it is invaluable, entirely preventing fracture of the wood, straining the legs, or breaking out of the screws, which is constantly resulting from excessive leverage, and faulty construction of the ordinary castor; for this work I recommend the castor without a wheel. For tables and extra heavy work, the one as drawn with a wheel in the front, under the centre of action, is the best."

From this it is to be gathered that there are two varieties of the Cantilever Bowl Castor, one without roller, and the other with roller. Further, each variety, as castors generally are, is made in two forms, one as a socket castor and the other as a screw castor. Mr. Hart will make castors to suit any customer in strength and style from $\frac{3}{4}$ in. to 2 in. Those that are kept in stock, and which will meet all ordinary purposes, are made in four sizes, namely, $1\frac{1}{8}$ in., $1\frac{1}{4}$ in., $1\frac{3}{8}$ in., and $1\frac{1}{2}$ in. All are strong cast, and of brass, and are supplied in sets of four at the following prices: No. 1 Socket Castor, without Roller, from 3s. 8d. to 5s.; No. 2 Socket Castor, with Roller, from 4s. 2d. to 6s. 4d.; No. 3 Screw Castor, without Roller, from 3s. 2d. to 4s. 6d.; and No. 4 Screw Castor, with Roller, from 3s. 4d. to 4s. 10d. Plate castors, triangular, square, or round, are supplied at precisely the same prices as screw castors. In this form the castor is attached to the plate, and the plate is pierced with holes countersunk to receive the screws by which the plate is fastened to the wood.

THE EDITOR.

SHOP:

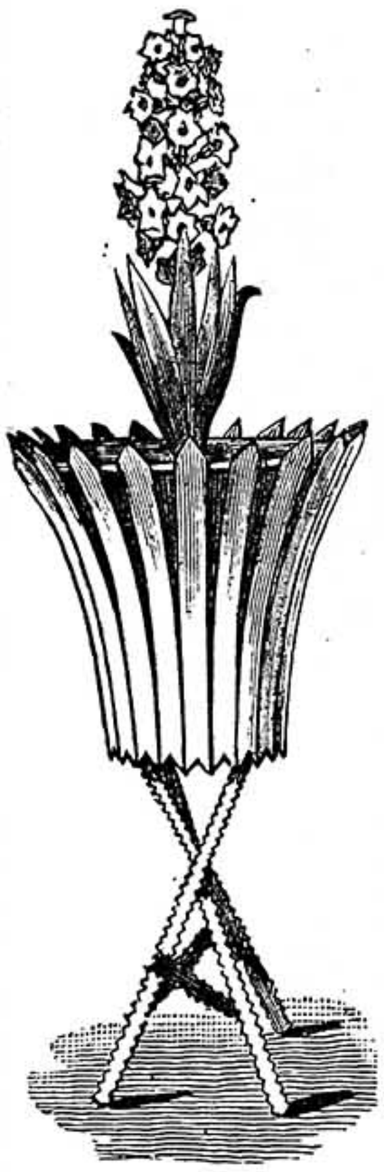
A CORNER FOR THOSE WHO WANT TO TALK IT.

*** *In consequence of the great pressure upon the "Shop" columns of* WORK, *contributors are requested to be brief and concise in all future questions and replies.*

In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of WORK *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

I.—LETTERS FROM CORRESPONDENTS.

A Cheap Flower Stand.—J. L. (*Somerset*) writes:—"The original from which the accompanying sketch is taken is made from boxes in which cheese is sent to this country, and is quite within the capacity of any amateur who has the slightest knowledge of tools and wood. The way in which I made mine was as follows: I first cut the box into strips (following, of course, the circumference) about ⅜ in. wide; these again I cut into lengths of about 8 in., shaped as shown in sketch. Next I got a piece of wood 1 in. thick, and cut out a circle 4½ in. diameter. To this I nailed the strips, letting the ends come about 1 in. below the piece of wood previously mentioned; this forms the bottom of the stand. For greater strength, I put a piece of wire about halfway up the strips inside, to which I fastened the strips with copper bracing wire. The legs are of small square pieces of oak, and are so fixed by boring holes in the bottom of the stand that they will cross each other about 2½ in. from the lower part of the stand. I notched mine with my pocket-knife. There are three other short pieces put on in the direction indicated in the sketch. When all was together, I stained the whole a dark brown, finishing off with a coat of varnish, thus making the whole thing look very pretty—prettier than my drawing, as I cannot draw very well now, having allowed my talent in that particular to rust. It is cheaply made, the whole costing not more than 6d., including stain and varnish."



A Cheap Flower Stand.

Wood-Carving Prizes.—WOOD CARVER writes:—"I think the matter of judges and the adjudicating generally in wood-carving competitions is a subject which should have more attentive consideration than it at present seems to receive in many places. It is not fair to encourage a number of workers to compete for prizes unless a *competent authority* is consulted on the merits of the exhibits. I have just heard of a case at Cheltenham, where the exhibits were large and important, and a village carpenter was called in to award the prizes."—[This is certainly a direction in which our correspondent's suggestion cannot be too promptly acted upon.]

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

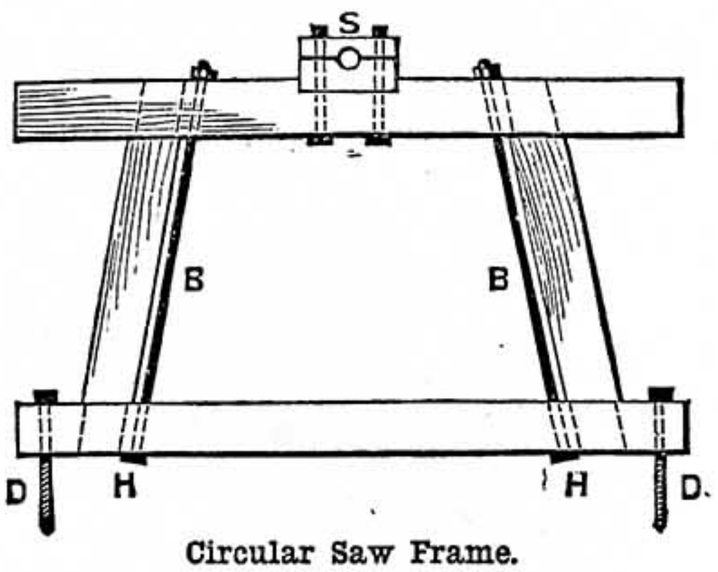
Detective Camera.—H. A. (*London, S.E.*).—The most simple kind workable is little more than a small box of the exact length to suit the focus of the lens used when focussed on objects about 10 ft. or 15 feet in front. Taylor, of Slate Street, Leicester, makes lenses especially suited for this work, about 6 in. focus. One of these lenses fitted into the front—which lens is flush with the front of the box, to allow the easy application of an up and down shutter—and the other end grooved to receive dark slides is practically all that is wanted with a lens of *fixed focus*. The whole may be covered in imitation of a brown-paper parcel. The slides may be changed in the ordinary way and carried in the pocket until required. A small finder may be fastened to the top of the box, easily taken on and off. Very good work has been done by a simple arrangement of this kind. H. A. will find that good work does not depend so much on the instrument as on the deftness with which it is used. Many of those in the market are needlessly elaborate. Anyone with a fair amount of constructive ability is able to make a good workable apparatus of this character. It is only when arrangements have to be made for *altering the focus* that fine and difficult work is necessary. Very good pictures have been taken by one made only of cardboard, dark slides included.—D.

Poster Painting.—W. H. (*St. Helen's*) and J. E. (*Skipton, Yorks.*).—Before this answer appears the Editor will have an article in his hands on Poster Painting.

Pelican Writing Pencils.—A. S. (*Newport, Mon.*)—Messrs. Brodie & Middleton, artists' colourmen, Long Acre, London, manufacture sable-hair pencils of the very finest description, and in all sizes. If you require an extra large size, and they have not got it in stock, they will make it to order in a few days. Of course the large size sable pencils are very expensive. The price of sable, too, has recently gone up, so you must get special quotations, and not depend on catalogues.—H. L. B.

Gilding on Glass.—EXILE.—Burnished gilding on glass would unfortunately take up several columns of "Shop" if described fully enough to be of any use to you. Articles will, no doubt, appear in due course.—H. L. B.

Hand Power Circular Saw.—COMPO.—Let me say that if you increase the speed of your saw, even then you will find it no easy work to drive through a piece of pine 2 in. or 3 in. deep. The fly-wheels generally fitted to such benches are too light to drive off from with belt or strap. I should advise you to go to a marine-stores, or some such place, and try to purchase a second-hand iron wheel about 5 ft. diameter, with a heavy rim; and at the same time look up a pair of stools and bearings and a piece of shafting about 3 ft. or 3 ft 6 in. long, that will fit hole in boss of the wheel. When these are obtained, then commence to make your wood frame out of 6 in. by 4 in. red or pitch pine. The frame should be 7 ft. or 8 ft. long, with four legs. At the bottom of legs there should be two pieces mortised lengthways of frame; as you wish the frame to be removable, the frame should be well mortised and bolted



Circular Saw Frame.

together. Then get four good wood screws, and if you are working on a wood floor screw the frame to the joists; if not on a wood floor, dig places for two sleepers in the ground and screw to them, fixing the frame from centre of it to centre of pulley on saw spindle; if you have room, from 12 ft. to 16 ft., as a long strap will drive with less tension and require less power to drive it. After the frame is fixed, bolt the stools on the frame; then lay the piece of shafting in the bearings, letting the end on which the driving wheel is to be keyed project the length of the boss of the wheel outside the bearing. On this end file a flat for keying the driving wheel; and on either side of the bearing farthest from wheel make a mark on the shaft, and close to the marks get two collars shrunk on to keep the shaft in place, and to prevent end play. This done, screw down top blocks, and then key on driving wheel. If there is not a hole in one of the arms of the wheel, drill one through to fix a handle to turn the wheel, and as far up as you can conveniently reach and turn the wheel. Now get a 6 in. pulley, and key on the end of saw spindle, seeing that both wheel and pulley are in line; then put on strap, crossing it if your bench is in position for crossing it. By crossing it will have greater grip on the pulley, and will not be so liable to slip. It will be seen by having 5 ft. wheel and a 6 in. pulley, that the saw will make ten revolutions to one of the driving wheel; and if you are driving a 12 in. circular saw, the traverse at point of teeth will be a little more than 31 ft. to one turn or revolution of driving wheel. Care should be taken in feeding the timber, which should be fed very slow. The annexed sketch is one side of the frame that is to carry the driving wheel, showing how it should be mortised and bolted together. B, B, are ⅝ in. or ¾ in. bolts; the heads H, H, should be let in level with the wood; D, D, are holding-down screws; S, stool and bearing.—A. R.

Billiard-Ball Dye.—SPOT-STROKE asks for a good red dye for billiard balls. This should not be difficult, though it is a craft secret. Billiard-table makers and sellers do not dye their own balls, nor do they know how it is done. My experience with dyes is that cleanliness is one of the factors of success. The ivory must be cleansed of its acids and grease for some little distance into its surface, just as leather is, or it will not take dye or lacquer. The dye used is the result of boilings of red cloth that is left from the making up of soldiers' coats. This red is from the cochineal insect. Before putting the balls into the liquor, make a bran bath by boiling good bran for an hour; strain off the liquor, and let the balls soak in this liquor for half a day or more. Thoroughly dry the balls, avoiding the touch of the hands as much as possible; then put them in the hot red dye, and allow to remain till the proper colour. Another dye is common sumach. Boil or scald three pounds of sumach; put the prepared balls into this liquor after it has been decanted: let them be in it till it is cold. Much of the commercial dye is poor in penetrating quality, only suitable for wood or paper. If you can make your own magenta dye, here is a simple recipe. Heat commercial aniline with the tetrachloride of tin; or better, nitrate of mercury, or for cheapness, arsenic acid serves—twenty parts of the latter to twelve parts of commercial aniline, to be heated in a clean cast-iron still up to from 300° to 338° Fah. Water and aniline will pass over. After some hours, steam is blown through the mixture in the still, which brings over more aniline. The lid is removed, and the mixture allowed to cool sufficiently to be put into a large vessel, in which it is boiled with an excess of water. It is then filtered to remove insoluble matters. Common salt is added to the filtrate, which precipitates the colouring matter in a crude form. This is washed on a filter, and afterwards dissolved in boiling water. From this the magenta crystallises out in cooling, ready for use. To make the dye from the cochineal insect is a sure plan of obtaining a penetrating dye.—J. C. K.

Looking Glass.—S. H. (*Walsall*).—Recipes and directions for silvering glass by nitrate of silver have appeared in "Shop," and using those, it would take not quite an ounce and a quarter (1¼ oz.), or say 620 grains, to cover the quantity of glass you wish to do; but there may be something in your recipe to alter the quantities, that I cannot tell without seeing it; but, may I ask, are you going to try a new recipe upon six square feet? Would it not be better to use a small piece first? As regards the latter part of your letter, "Is it possible for an amateur to bevel the edges of glass?" I should say, Yes, it is *possible;* because, with money to buy tools, and time to gain experience, an amateur may be able to turn out as good work and do all that a professional can do.—W. E. D., JR.

Dulcimer Pins, etc.—E. H. (*Bethnal Green*).—You can obtain these at almost any wholesale warehouse. My object in recommending Messrs. Chilvers & Co., of Norwich, was that, being wholesale dulcimer makers, they make a speciality of the fittings, and can be relied on to supply just what is required.—R. F.

Bamboo.—VICTOR.—Bamboos may be bent by heating them in a smokeless flame. The heat renders them pliable, so that they can be bent without much difficulty. When cold, the shape given is retained. Take care not to burn the bamboo; and to avoid this, as well as to prevent the bend being too sharp, keep it moving, and heat a length of some inches, according to the size of the work.—D. D.

Bow Saw for Machine Saw.—J. G. (*Nottingham*).—Half-inch is quite broad enough, if not too broad; mine is only ¼ in., and it acts well enough. The usual holes are right. I do not think that you could successfully fix a grindstone on it. I thought of doing so at one time, but abandoned the idea as not being practicable. Instead, I constructed a small compact treadle grindstone, with trough complete.—F. H. R.

Model Wheels.—SILICATO.—As you seem to require felloes and spokes on rather a wholesale scale, you had better advertise in WORK Sale and Exchange column for a band-saw man.

Observatory Hive.—J. J. (*Kidderminster*).—I will reply to any questions through "Shop."—APIS.

Beehives.—UBIQUE.—No instructions have been given as to the construction of the "Lanarkshire hive," nor do I know of the existence of such. There are the Stewarton, with octagonal boxes, and the Renfrewshire Stewarton, which has movable bar frames; either of which may be known locally under the term Lanarkshire. A paper on the construction of the Stewarton hive may appear later on, as it is in every respect an excellent hive.—APIS.

Failure in Silvering Glasses.—J. W. M. (*London*).—Your letter says that "You have followed the directions given in 'Shop' for silvering glasses, but have failed owing to holes in the foil when finished, and suggest that something else is mixed with the mercury by manufacturers, as you have seen some done, and it acted better than yours did." I think anyone of two or three things will account for your failure. Nothing is needed but mercury to pour on the foil; and part of your letter proves it when you say, "All the rest is right but these holes." But if you think differently, why did you not ask the workmen you saw what they were using? I think their reply would have convinced you. Now, in reading over your letter carefully, it strikes me that you have not used sufficient mercury, as you refer to laying it on with a hare's foot (I venture to say you did not see those workmen do that). Plenty of mercury must be used; a little will not do. It is nearly all pressed out again, and recovered when the glass is put on and weighted; but enough must be poured on at first to cover all the foil. If you only put a little in the middle and then try to spread it over the whole surface, it is sure to rot the part where it is first poured on, and holes are the result when finished, the thinnest places, of course, suffering most. For this reason, too, a stout piece of tinfoil should be chosen, as the thicker it is, the longer it will resist

the mercury; but above all, be quick in getting the glass on when once you have covered the foil. The last suggestion I make is that you get a fresh piece of foil, and at a different place, as I am told that you may sometimes happen to get hold of a piece of tinfoil which will not amalgamate with mercury because of its not being pure; I have not known it to occur, but I have it from one who has met with it, so if you still do not succeed with more mercury and stouter foil, try another shop for a better quality; but I think your mistake has been in letting the mercury remain on the foil too long before the glass is put on.—W. C. D., JR.

Hall Lamp.—W. H. T. (*Harringay, N.*)—We have not published working drawings of this; nor can we give you the addresses of our writers.

Bracket.—W. T. H. (*Wellington*).—Consult the Indexes of WORK, Vols. I. and II., for bracket designs and fret-wood dealers.

Shooting Board.—J. A. (*Gristhorpe*).—You should purchase the Indexes to Vols. I. and II. of WORK. Your difficulty in obtaining numbers of WORK would be obviated by subscribing for it through the publishers, Cassell & Co., Limited, London, E.C.

Staircasing and Handrailing.—M. A. P. (*Birmingham*) and M. T. O. (*Stockport*).—When I can meet with a man who is duly qualified in three important respects to handle this subject, it will be taken up and dealt with. Firstly, he must be thoroughly well acquainted with this branch of joinery; secondly, he must be a good draughtsman, able to put his work on paper in a clean and efficient manner; and thirdly, he must be able to write clearly and intelligibly, and capable of imparting instructions so fully and so plainly that no one may fail to understand his meaning. I have met one man, as I have said, who could satisfy the first two requirements, but he could not write. Had he remained within my reach, I would with my own hand have put his teaching, orally given to myself, into intelligible form. He did not do so, and so the thing fell through; and now I should decline altogether to undertake the task of licking crude thoughts and language into shape. Others have proposed to take up the subject; but when it has come to the scratch, they have proved unwilling—to speak in the mildest terms—to satisfy me as to their qualifications. Now you see the position, and are, I trust, satisfied with my assurance that when the right man turns up to undertake the work, the work will be done.—ED.

Ancient Lights.—LOTO.—This notice, which is sometimes met with on buildings, refers to lights which have become a rightful possession by the lapse of years, and which, therefore, cannot be encroached upon or impaired by any proposed new building, even though no plan or stipulation as to such lights may appear in the said light-holder's lease.

WORK Registered.—MEREDITH.—As WORK contains no matter which is essentially "news," it cannot be registered as a newspaper.

Brass and Iron-Work.—W. E. P. (*Ross, Herefordshire*).—I am unacquainted with any technical work on the subject, but you will find some useful and highly artistic designs for brass and iron in a work by A. W. N. Pugin, Esq. (1836). London: Ackerman & Co. There are examples of all kinds of ecclesiastical fittings and furniture in brass and iron-work, commencing with nail-heads, crosses, hinges, locks, bolts, knockers, chests, coffers, lamps, terminations for turrets and gables, railings, lecterns, branches for lights, windows, escutcheons, etc. As to the tools required, they may depend in a great measure upon what you want to make. The brass ornaments may be either stamped, pressed, or flied out in a press, and stamped into the required shape; or they may be spun into shape in the spinning lathe, and chased or engraved by way of ornamentation; or the brass ornaments may be *repoussé* work, entirely done by hand. By reference to Vols. I. and II. of WORK, something of all the above processes may be learned, and the suggestion of ornamental brass and iron-work has been noted; and instructions, with suitable designs, will be given in WORK as soon as arrangements can be made. Commercially, ornamental brass and iron-work is divided and sub-divided for economic reasons into many branches and processes, and can only be carried on with large capital and a thorough practical acquaintance with the business. I enumerate a few:—The designer, ornamental worker in iron, stamper, press-worker, chaser, engraver, spinner, buffer, and finisher. Then there are the maker-up or putter-together of the different parts, and the erector. A good firm for presses and American drawing machinery is Messrs. Taylor & Challen, Great Hampton Street, Birmingham; brass sheets and drawn tubes from Messrs. Tucker, York Street, Sheffield. Mr. A. Foster, Rockingham Street, Sheffield, makes and supplies tools for *repoussé* work, embossing, and chasing; and tools for engraving may be had from Messrs. John Sellers & Son, Arundel Street, Sheffield. As to your inquiry for black printed patterns, all patterns of any commercial value would be found in "The Manufacturer's Private Pattern Book," which might sometimes be picked up for a mere trifle at a dealer's in second-hand books.—N. M.

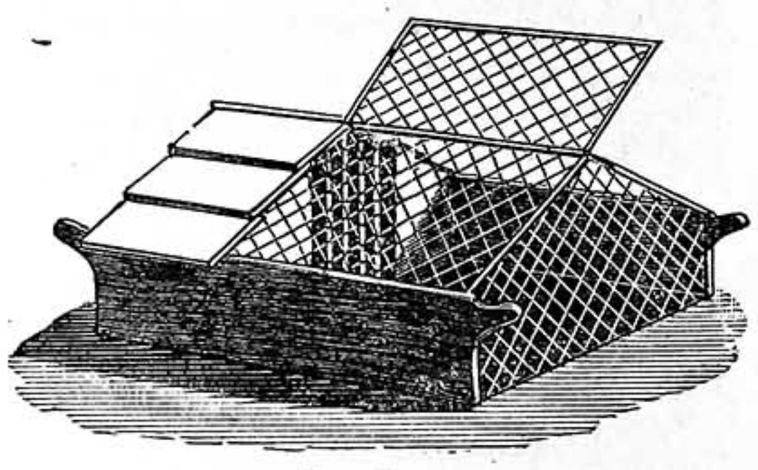
Index.—J. J. (*Birmingham*) and others.—The Index to Vol. II. of WORK is ready, and can be had from the publishers, Messrs. Cassell & Co., London, E.C., 1½d. post free.

Wood Merchants.—NO NAME.—You can get walnut at "Ware's," Kennington Lane, S.E. Consult Index to Vol. II., which is now ready, price 1d., and you will see several addresses of places you want.

Æolian Harp.—M. J. C. (*Glasgow*).—In Nos. 55 and 58 will be found information *re* the above. They can be had post free from the publishers, 1½d. each. The Index to Vol. II. is ready, and can be had of the publishers, post free for 1½d. It will be of great use to you for reference.

Binding.—BLOCKHEAD.—The four-page supplement of WORK should be pasted by "tacking" (as explained in the articles) it to the back of the section immediately preceding it. It is paged, so be careful to put it in its proper place. The fastening of the thread in sewing books is very simple. When you begin to sew, leave a long end where you started—that is, at the tail of the first section. Having passed the needle *up* the whole section, come *down* through the second; bring out the needle, and fasten the thread by tying it to the end which was left at the beginning. Now go on until you arrive at the head to the third sheet. Bring out the needle and pass it between the second and first sheets behind the thread, make a loop, and pass the needle through it and tighten up. When you come to the bottom of the fourth sheet do the same, and so on and on until the sewing is complete. I think this is simple enough without a diagram. The ends of the bands are first scraped thin; and after the end-papers have been placed upon the book, the slips, as they are called, are pasted and spread out flat upon the side of the book on the top of the end-paper. They should not be more than 1 in. long, and the reason of making them flat is to prevent them appearing like great lumps of rope when the book is opened.—G. C.

Hen Coop.—FACTS ON.—I give a sketch of above as supplied and manufactured by Messrs. Boulton & Paul, of Norwich. It is claimed for this coop that it is perfectly secure from inroads of vermin. The whole bottom of coop and run being



Hen Coop.

covered with 1 in. mesh wire netting, it is impossible for rats to get into it. The wire netting bottom lies flat on the ground, and can be covered with sand, or if on grass, the chicks run over it with perfect ease. When coop is shifted, all impurities fall through wire netting, and are readily swept away. Size, 5 ft. long, 2 ft. wide, 20 in. high; price, 15s.—E. D.

Copying Printed Matter.—W. O. J. (*Carnarvon*) will probably find photography the most satisfactory and simple way of reproducing printed matter.—S. W.

Materials for Painting on Glass.—G. C. (*Reading*).—Let G. C. try Messrs. Brodie & Middleton, Long Acre, W.C. They are, we believe, the London agents for the materials prepared by Mr. Hancock, of Worcester.—S. W.

Firing Paintings on China.—F. H. B. (*Barking*).—The home firing of painted china, as of painted glass, is generally done in what is called a "muffle"—a kind of box made either of iron or of a combination of iron and fire-brick; the "Automatic Kiln" is of this latter kind. It is said to be especially suited for amateurs. Purchasers are furnished with full instructions for fixing and using it.—S. W.

House Painting.—DECORATOR.—All the back numbers of WORK can be had through your bookseller or from the publishers. The Index to Vol. I., which can be had for 1d., will tell you the numbers.

Scene-Painting Materials.—W. P. (*Burton-in-Lonsdale*).—Any dealer in colours could supply you with paints. Consult the advertisements in WORK.

Self-Centring Chuck.—AMATEUR.—It is out of the power of an ordinary amateur to make a self-centring chuck. To be true to their name, the chucks must be exact in every part, and the most perfect of workshop appliances is needed to effect this. Even when a perfect chuck is made, having each of its jaws at an equal angle to each of its neighbours, and moving each jaw equally in obedience to the moving screws or spiral groove, a little variation of hardness in the jaws and some violence by the turner, and the accuracy is gone.—B. A. B.

Soiled Book.—J. B. (*London, W.C.*).—If the title-page of your book has only been soiled by "damp fingers," it could be cleaned by rubbing it carefully with bread-crumbs or indiarubber. If the latter is used, be careful not to rub too hard, or the cure may be worse than the disease. If there is any oil upon it, it should be washed with spirits of turpentine very carefully. The turpentine will run into the paper and turn it quite black-looking, and you will think it is completely spoiled; but it will all dry out, and the oil-stains will have disappeared.—G. C.

Baking Bicycle Enamel.—C. E. B. (*Poplar*).—The stove is heated up to 350° or 400°, using a thermometer. It is supplied with an arrangement of gas-pipes underneath; and a good supply of gas from the main is required. The work being first thoroughly cleaned from rust and grease, is coated with stoving enamel, called first coating, put in the stove for several hours. The first coat, when hard and cold, is smoothed with Tripoli powder, and another coat of finishing stoving enamel applied and baked as before. The stove has several angle iron ledges inside, on which various bars rest, on which to place or hang the work. The apparatus, including gas connection, would cost from £11 to £12; and unless your correspondent means to go into the thing on a large scale, he had better send out his bicycle or bicycles to a "baker."—A. S. P.

Small Organ.—GOOD TIPS.—It is possible to build a useful little pipe organ which will only occupy the same ground space as a moderate-sized American organ; but one must not expect too much from so small an instrument. The following specification is for an instrument which would be 4 ft. to 4 ft. 6 in. wide, and about 20 in. or 21 in. deep, exclusive of projection of keyboard, and 8 ft. to 9 ft. high—

1.	Dulciana	44	pipes	8	feet tone
2.	Stopped Diapason (bass) ...	12	,,	8	,,
3.	Small Gamba, Keraulophon, or Vox Angelica ...	44	,,	8	,,
4.	Swabe flute, for principal..	56	,,	4	,,
	Total ...	156			

The sound-board for this would be about 4 ft. long and 18 in. wide if made singly; but it would be better to make it in two, and 3 in. or 4 in. in length might be saved, and more room gained for channels. Thus, make the front portion 3 ft. 9 in. long and 10 in. wide, with forty-four channels to accommodate the forty-four pipes in the treble of Nos. 1, 3, and 4. The back portion would be 3 ft. 9 in. long and about 6 in. wide, and would accommodate the twelve large pipes of Nos. 2 and 4, each standing in a single row. These two sound-boards would be united over a single wind-chest. The height of the instrument could be reduced, if required, by planting off a few of the largest pipes of each stop either at the front or ends. An octave coupler could be added if required, but would, of course, necessitate an extra octave of small pipes for each treble stop. The whole affair could also be enclosed so as to obtain a general swell. As regards a book on the subject, see replies in back numbers—*e.g.*, the last one mentioned in the answer by "K" (column 1, page 649, of No. 92) would just suit you, as it contains full and clear instructions for making every part of the instrument.—M. W.

Writing Cabinet in Carved Work.—X. L. U. MAY (*Hebdon Bridge, Yorkshire*).—I am obliged to you for your interesting communication respecting the construction of a writing cabinet from an old carved oak chest that belonged to your great-grandfather. It is most creditable to you that you should have evolved so good a piece of work from the materials at your command. I cannot, I regret to say, find room for its appearance in WORK; and your drawings shall be returned to you if you will favour me with your actual name, or certify me that the initials and name given above, which are open to suspicion, are those which really and truly belong to you.

Artistic Lithography.—H. G. (*Coventry*).—The above series is commenced in No. 106 of WORK.

Screws.—MECHANIC (*Leeds*).—An article on the above appeared in No. 109.

Ladies' Writing Table and Escritoire.—H. W. (*Rochester*) asks for a design for the above. The very thing he asks for he will find given in No. 56 of WORK.

How to Net a Garden Hammock.—F. W. P. (*London, W.*).—The article on the above appeared in WORK, No. 79. The Index to Vol. II. is now ready, and can be had from the publishers, post free 1½d.

Clock Cleaning and Repairing.—E. D. (*Deptford*).—The clock cleaning and repairing articles appeared in Vol. II. of WORK. You can get the Index to the volume and see what numbers you want. All the back numbers are in print, and can be ordered through your bookseller or from the publishers.

Castings.—B. (*Dundee*).—Having answered your questions as to castings, we can do no more.

Bellows.—E. A. and F. G. (*Bristol*).—Frame your reply so that it will be useful to all readers, and not to CARO only. All replies must go through "Shop."

Brass Angle and Pieces.—BERTIE.—Apply to any tool maker who supplies cabinet ironmongery. Many names have already been given in the pages of WORK.

Dry Earth Closets.—UBIQUE.—For the construction of an earth closet, sifted ashes mixed with fine dry mould would do excellently.—APIS.

Colouring Clays.—WORKITE.—Clay has many names. The chief one is "silicate of alumina" in one of its aspects of composition—the most general

one. Clay is the result of the decomposition by chemical and mechanical action of water and air on rock containing felspar, quartz, and mica; and by the action of water and air at certain temperatures it can be resolved into rock again. If for pottery, or extraction of metals or pigments, salts or acids, the processes are amply detailed in Roscoe's "Inorganic Chemistry" (Macmillan, 1880); and John Hunter's "Short Manual of Analytical Chemistry" (Simpkin and Marshall, 1887). W. A. Miller's "Text-Book of Chemistry" is a good book (Longman & Co., 1871); and a more extensive work, "Elements of Inorganic Chemistry," by the same author and publishers (1878); also Bloxam's "Chemistry" (Churchill & Co., 1890). In recommending these almost exhaustive treatises on earth clays, first, you will have a new vocabulary and a symbolisation of names demonstrated algebraically to learn; but that need not concern you much—it does not ninety-nine hundredths of the workers in clay, chalk, etc., for whom these are almost sealed books—and the formidable formulas you need not investigate for accuracy; every new decade modifies the past decade's assumptions and conclusions. One or two works have the word loam in the indices, and in the body of the work simply define it as "clay" or "impure clay," "clay from which bricks are made." It is an earth far too valuable for brickmaking, as well as often unfit. Some of it is worth 3s. 6d. per square yard, to be dug up by the buyer and carted several miles. It is the garden earth of these islands. The value of these books is in their chemical analysis of the earth's crust. They are beginning to learn about the fertilisation of earths. In following their guidance, you will find the track clear for you, and learn that, in operating chemically upon clays, you obtain aluminium and other metals; and learn also that there is about two pounds of aluminium and iron in every red brick that is used in buildings. The study of pigments in earths you will find interesting. What in wet weather we call mud is often paint, as umber, ochre, sienna, and various other clays that yield colour for the painter. Broadly defined, clay contains iron: ferro-oxide. Marl contains lime carbonates. Loam the chemists have not done justice to as the most fertile of earths. England now imports one-third of its food; without loam it would have to import two-thirds, and half its flowers also. The fossils, so valuable as manure, are well understood by farmers, even without chemical knowledge. Coprolites, which when ground to powder smelling and looking exactly like curry-powder, used to sell at £20 a ton. It is the remains of saurian animals, the teeth often found still perfect in shape. Pipe-clay, china-clay, chalk, etc., will yield new elements under the action of the blowpipe, pipe-clay becoming a colourless glass. The microscope will be essential for your studies. The clay—silicate of alumina—is mainly from granite. Its quartz is translucent, its felspar is cream-coloured, and its mica of glittering scales. In mixing clays you obtain porcelain. Thus: Kaolin or china-clay, 62 parts; Bougival chalk, 4 parts; Humont sand, 17 parts; felspar, 17 parts. This is the formula for the celebrated Sèvres porcelain. For pottery, clays need preparation and weathering, and have to be mixed with sand, chalk, ashes, etc., which prevent shrinking and warping under the action of heat. The clay worker puts back into the clay its rock-forming constituents, which the sun and rain had taken out. Glazes on pottery may be as simple as a dust over of sand, and kilning with salt in the furnace of kiln; or, for fine work, silicate of soda and lime, also silicate of potassium and lead. For colours from clays and earths you will have a vivid world of beauty open to you, and have to learn the new vocabulary of their names, which will mar your progress considerably if you wait to do that. You will be imperceptibly carried onwards in your studies to wider vistas of the unknown. The lapis lazuli is a silicate of alumina combined with lime, soda, sulphuric acid, and sulphur—the source of the once costly regal colour, ultramarine, now one of the medium-priced pigments made from clay: that is, kaolin, 100 parts; sodium carbonate, 100 parts; sulphur, 160 parts; and aluminium silicate, 17 parts, or also an addition of charcoal, 12 parts. In operating chemically upon clay you will soon find you have the metal aluminium. You will find you produce alum and iron, especially in the red clays. This alum, you will find, embodies as elements certain metals—but I must not detail the process of aluminium making, as it is now so well known. Perhaps you are near potteries, and can get to work in one to learn all about clay technically. China clay is called by chemists "hydrated aluminium silicate." Besides making hard chinaware, it is used as a dressing for paper, calico, and fustian. In this last form it is a source of permanent injury to health of wearers, by attracting damp to clothes worn by hard workers having fustian materials for make or linings; causing rheumatism to the wearers by the damp held by this clay. Its use thus ought to be penalised. Chalk—the remains, mostly, of marine shells—differs in density and fineness. The finest natural chalk is used for billiard chalks without preparation of any kind. England's manurial earths are but imperfectly studied by scientists, though known to farmers and old writers like Jethro Jull, who used common terms in speaking of them in his excellent writing on farming. Clay is the most valuable of manures for peat land, also with peat combined for light sandy land. Peat is excellent manure for stony land known as "stone brash." Chalk has general excellence to manure all soils. This interchange of soils serves another purpose; it eradicates and kills perennial weeds. Poppies cannot live in clay soils; chalk kills the heather; and many services to agriculture result from mingling of soils.—J. C. K.

Druggists.—F. L. W. (*Sandown*).—I do not know of any special firms who can be called "wholesale druggist to the cabinet and polishing trades;" but if you mean those who can supply lac, resin, methylated spirit, and such like used in making polish and varnish, you will find Burgoyne, Burbidge & Co., 16, Coleman Street, E.C., able to do the needful. Bottles can be got from Breffitts, 83, Upper Thames Street; or from Wright, Urmson & Wright, Southwark Street, London.—D. A.

Jewel Cabinets.—Z. L. R. (*Newhaven*).—I can hardly comprehend whether you want a swinging glass on top for toilet purposes or if I am to form my conclusions from the continuation of your letter, which says, "For a watch to hang on." At any rate, it matters little whether it be a swinging glass or a swinging lump of wood; in the former case, you must rebate it to admit the glass, and in the latter instance, hollow it slightly on the front for the watch's reception. A small peg inserted in the top of the stand will support the watch. The stand may be secured by thumb-screws between two brackets, the latter being further united by a cross-rail (as in Fig. 3), and the whole secured to the back of the cabinet. You ask for drawers and folding doors. As my suggestions may be of use to some who would not wish to repose the article in the company of a dressing-table, I have supposed

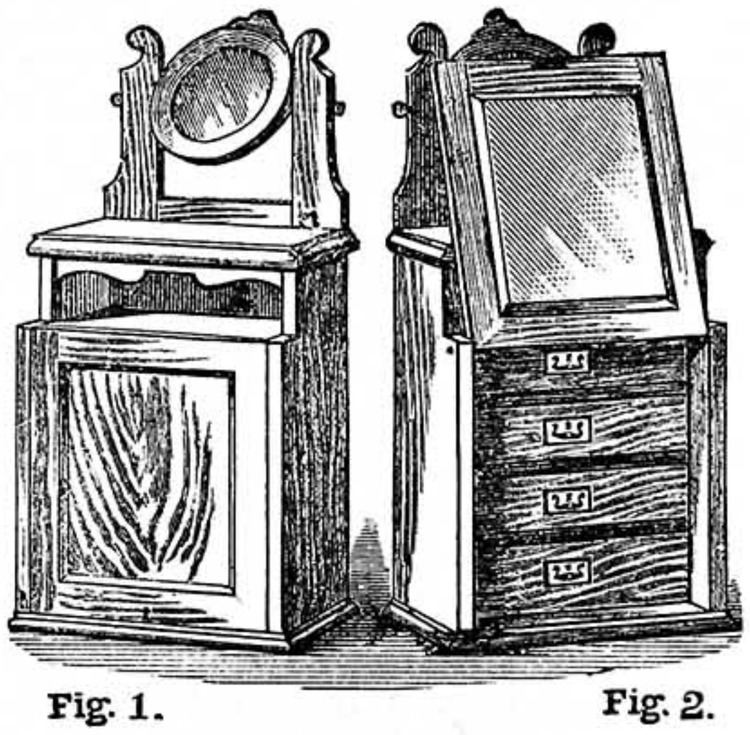


Fig. 1. Fig. 2.

Fig. 3.

Jewel Cabinet. Fig. 1.—Jewel Cabinet. Fig. 2.—Cabinet with Flap Door opened (may be fitted with Mirror). Fig. 3.—Section of Back Uprights and Rail.

that the door should open upwards, and be fitted on the inner side with a mirror. For appropriate remarks concerning this part, read through my article, "A Combination Bedroom Suite" (No. 26, Vol. I.). For the purpose of retaining the glass door in an elevated position, it is advisable to construct the cabinet in such a way that the front edge of the top board lays a short distance back from the front of the main portion of the article. The door will then lean against the top board. The former must be pivoted at the top between the sides of the cabinet. You might groove and tongue the sides and the top (dovetail form); but screwing will be sufficient for the back and bottom boards. Drawer runners, also, might be tongued to the sides. Have sunk handles to the drawers, that they may lay flush.—J. S.

Chasing.—MECHANIC.—In the first place, you must know that a knowledge of this trade is usually gained by apprenticeship, and that, although the process is fully described in the article in No. 92, Vol. II. of WORK, it is not to be expected that a person can at once jump into it and earn a living without much practice. The occupation is a very clean and pleasant one; and the remuneration depends on ability. An average workman can earn 50s. per week comfortably, and at present work is plentiful; but it is an occupation that depends largely upon fashion. Chased work is greatly in demand at present; and although a first-class workman can always depend upon employment, when the fashion changes some will have to go. However, if you are determined to go in for it, my advice is as follows: Keep to your present employment, if you have one: purchase the necessary tools for chasing, and work at home in your spare time until you are perfect. Then, when you think that you are competent, take a sample of your work round to the manufacturing silversmiths—you will get the names from the directory—and ask for a job; you will then see how you stand. London, Birmingham, and Sheffield are the three towns where this work is carried on. Most of the work is done in shops, not at home. I am not well acquainted with the London tool-makers, but write to Towneley, Bull Street, Birmingham, for their list. The snarling-iron is not usually quoted in the list, and would have to be ordered; it might cost about 10s.—F. R. H.

Xylonite.—J. W. P. (*London, E.C.*).—An article dealing with the use of xylonite for fretwork is in the Editor's hands, and you will find a great deal of information which will be useful to you and your chums who are fret-cutters. In the meantime, I may tell you that the best way to fasten sheets together for sawing several at a time depends on the thickness of the material. If this is less than about ¼ in., I find it best to glue them together, with a piece of paper between; thicker stuff may be fastened with wire pins in the waste, but even for this glue is better. Certainly an ordinary drill will do. You could easily have ascertained this for yourself by experiment. I quite agree with you that there is a good deal of monotony in always using wood for fretwork, and that novelties should be welcome to the majority. Have you ever tried marquetry cutting? There is plenty of variety and interest in this work and its attendant operations. Please note that xylonite is spelt with an X, not with a Z, as you spell it.—D. D.

Chessmen.—W. E. H. (*Hebburn-on-Tyne*).—There is no reason why chessmen should not be made of imitation ivory. If you had taken the trouble to read WORK recently, you would have seen from the article on "Xylonite: its Nature and Use," on page 787, No. 101, Vol. II., that ample information is given about it. If you want your chessmen to resemble real ivory in appearance, get the "grained ivory" xylonite. You cannot make it. Buy the raw material, and do the carving, etc., yourself.—D. D.

Tennis Shoes.—H. B. W. (*Rugby*).—I cannot say whether the method of soling mentioned on p. 808 would do for tennis shoes, but I suppose so. The gutta-percha will not require stitching to them any more than to boots. If you follow the directions given, it ought to be sufficient. I am not acquainted with the tradespeople in Rugby, but if there is a dealer in indiarubber or waterproof goods, even if he does not keep gutta-percha in stock, he can get it for you in the ordinary course of his trade.—C. E. M.

Table.—W. E. (*Wimbledon*).—Undoubtedly the best way of finishing your table top will be by polishing it. If carefully done, no injury should arise to the painted decoration, which, I presume, is done with ordinary oil colours as prepared for artists' use. The enamelled part will probably not require anything doing to it. Probably you will get an equally satisfactory result by simply varnishing the decoration with a brush, using artists' copal varnish. I do not think it would be of any advantage for you to varnish first and then polish; but if varnish alone does not suit, there can be no harm in your trying.—D. A.

Xylophone, Wood, etc.—E. F. P. (*Leicester*).—The best wood for the notes is rosewood, but you may use oak or pine with very good results. Pieces with knots should be avoided; and a more even tone is said to be got if all the pieces are cut from one plank. The notes are 1⅛ in. wide and ⅝ in. thick, and rounded on the upper side. Holes are bored about 1½ in. from the ends, and a cord is put through, with a knot between each note. If you want semitones you must have three cords, and put the semitones in groups of two and three in one row, and the naturals in the other row, the middle cord passing through both naturals and semitones, and arranging them similar to the keys of a piano. To find the approximate length of the notes, mark thirteen lines at equal distances, and at right angles to a base line. Make the longest line 12 in. (which is E), and the shortest 8 in. (which is its octave), and draw a line between the points thus marked. The intermediate lines will give the length of all the notes between; and by drawing more perpendicular lines at either end, the same distance apart, and prolonging the line, you can get the length of the notes above and below. They are laid on three straw ropes about ¾ in. diameter, and played by two beaters of hard wood. You can tune the notes accurately to a piano by cutting a little off the ends to sharpen them. The Editor has an article and drawings on the subject, which will be printed as soon as space can be found for it, which will be of service to you. You can make one with brass tubes in the same manner, drilling holes through the tubes for the cords, and using tubes from 1 in. to ¾ in. diameter. You can get the lengths in the same manner, and tune them by filing a little off the ends till of the right tone.—M.

Petroleum Engines.—J. H. D. (*Halifax*).—The petroleum engine is very similar in character to the gas engine. In one form the oil is not vaporised, but is drawn into the cylinder in fine spray mixed with air. The action, or cycle, as it is termed, is as follows: an outward stroke of the piston draws in behind it a mixture of air and petroleum spray; the next inward stroke compresses the mixture to about three atmospheres; and at the commencement of the next outward stroke the mixture is fired by a gas jet in a suitable slide. This engine is single-acting, and makes one effective stroke in four. During the fourth stroke, which completes the cycle, the products of combustion are driven out at the exhaust. In another form of petroleum engine, the oil is forced by air pressure into a vaporiser appended to the cylinder, and there mixed with air under pressure as it is vaporised. The heat for vaporising is at the start furnished by a jet under the vaporising chamber, and afterwards maintained by the heat of the exhaust. One stroke in four is effective, and the mixture is fired by an electric spark from a coil excited by one large bichromate cell. The impulses occurring at such comparatively long intervals, these motors require

much heavier fly-wheels in proportion to their power than steam engines, to ensure steady running. The cylinder is surrounded by a water jacket, to prevent over-heating. It has been proposed to make the cylinder with external ribs to carry excessive heat off by air currents, and so dispense with the water tank; but I do not know if this has proved a success. It is said that these engines do not require cylinder lubrication.—F. C.

Shoe Blacking.—SHOEBLACK.—There are a great many recipes for making both liquid and paste blacking, all more or less good for the purpose. The great secret in successfully making all the various blackings is the proportions of the ingredients used, the quality of them, and the perfect and careful mixing, so as to get a smooth, even product. Unless this is done, no satisfactory result can be obtained. Blacking from the following recipes may be made in large or small quantities without the use of machinery; but where large quantities are to be produced, it would be madness to attempt it without its aid. The recipes given are known to be good; but unless it is intended to make it a business to manufacture and sell, it would be a great waste of time and trouble to attempt it, as it can be bought so cheaply and so good. Liquid blacking:—Take of bone-black—not lamp-black—16 parts; treacle, 12 parts: oil of vitriol, 3 parts; seal, cod, or sperm oil, 2 parts; gum arabic, 1 part; strong vinegar or sour beer, 48 to 50 parts—all by weight. The first step is to place the bone-black in a large wooden, stoneware, or enamelled iron vessel, to which add the oil, and rub and stir them well together; when this has become a smooth, even mass, gradually add the treacle, still rubbing or grinding the whole together all the time each ingredient is being, and also after each is, added, until the oil is thoroughly amalgamated or "killed," and continue to grind or rub the mixture for some considerable time. Now dilute the oil of vitriol with about three times its bulk of water, doing this very carefully to avoid the chance of accident, and then add it, a little at a time, to the other ingredients, stirring them briskly during the time of addition and for some time afterwards, until it has become quite smooth and homogeneous. It should then be allowed to stand for two or three days longer, stirring in the meantime for half an hour daily. Having meantime dissolved the gum in the vinegar, add the solution gradually to the rest, and stir it briskly for some time, and again daily for three or four days. It will be found beneficial if all the ingredients, except the vitriol, be made hot before mixing, as the shining quality of the product will be greatly improved, and the time required in the manufacture will be shortened thereby. Another recipe is: 16 parts of ivory-black, 8 parts of treacle, 4 parts oil of vitriol diluted with 2 parts of water, 2 parts of the same kind of oil as in the former recipe, 1 part of gum arabic diluted in 64 parts of water for the final dilution in place of vinegar; all to be mixed and treated as in the first case. This makes an excellent blacking. Another recipe is the same as the last, but only taking 6 parts treacle, 1 part of oil, and omitting the gum arabic. This also makes a good blacking. *Paste Blacking.*—Take of india-rubber oil, ivory- or bone-black, treacle, and gum arabic, the same proportions as are given for the liquid blacking, but take care to dissolve the gum arabic in vinegar, using only one quarter of the proportions given in the other cases. The mass, when mixed, must be stirred daily for a week, when it will be ready for putting up. Another recipe for paste blacking is as follows: Ivory-black, 1 part; treacle, ½ part; sweet oil, ⅛ part. Mix them well together, as in the other cases, then stir in a mixture of hydrochloric acid, ⅛ part; oil of vitriol, ¼ part (each separately diluted with twice its weight of water before mixing them). The difference between liquid and paste blacking chiefly consists in the greater or less amount of liquid employed, and not so much in the materials and proportions. Blacking, both liquid and paste, should be kept in a cool and moderately dry place, and kept carefully corked, as exposure to the atmosphere is found to destroy most of its best qualities. I am not aware of any book being published on the subject, nor does it seem one of sufficient interest to induce a person to encounter the expenditure of time and labour needed to produce it.—C. E.

Drawings of Steam Engines.—H. M. (*Liverpool*).—Such drawings as you inquire about are not kept on sale. You should apply to some mechanical engineer, who may have sets of working drawings, tracings of which he might supply to you. As a rule, manufacturers do not supply tracings unless an order is in view, and then working details would not be given. The cost will depend upon the size and amount of work in the drawings.—F. C.

III.—QUESTIONS SUBMITTED TO CORRESPONDENTS.

Glass Writing.—W. T. G. (*Bristol*) writes:—"I have noticed on glass signs letters that look like mother-of-pearl. I shall be glad if anyone can inform me where it can be obtained, the cost, and whether it is made in leaves like gold-leaf."

Stereotyping.—S. T. (*York*) writes:—"Can any of the readers of 'Shop' inform me if the dipping-pan is now used for stereo work? What is the use of the floating plate? How should the plaster mould be placed in the pan—face up or down? on the floating plate or on the bottom of the pan?"

Clay Mixtures.—HEATHFIELDS writes:—"Will any reader give me information about building with clay mixed with straw? It was, I believe, common many years ago in some parts of the country for cottages, and was very warm and comfortable. The walls were very thick."

Fret Machine.—D. B. (*Wymondham*) writes:—"Seeing in your valuable paper WORK, page 846, No. 104, a description of a fret machine, will J. H. W. (*Chatham*) kindly inform me as to measurements, and how to make it?"

Sharpening and Clipping Machines.—W. B. B. (*Edinburgh*) writes:—"Can any reader give me any information as to how horse-clipping machines are re-sharpened?"

Fish Stuffing.—F. M. (*London, N.W.*) writes:—"Will any reader give me information on stuffing fishes?"

Staining.—J. W. B. (*Huddersfield*) asks:—"How can I stain oak, birch, etc., black by a kind of liquid which will sink into the wood; for when oak is shut up tight in a box with strong ammonia, the strong scent or stench causes it to become brown. What will stain other woods brown to match it, and sink in also?"

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Turned Wood Cases.—CHEMICUS writes, in reply to W. H. (*Stirling*) (see page 14, Vol. III.):—"I have found those manufactured by Messrs. E. B. Estes & Sons, of New York, to be both *good* and *cheap*. The *sole* English agents are Messrs. Kilner Bros., King's Cross Station, London, N. W. H. cannot do better than write to the latter for illustrated price list, which also contains several other kinds of turned wood goods."

Carved Wood Bellows.—TOPO writes, in reply to CARO (see page 14, Vol. III.): "Why does not CARO finish off his carved bellows himself, and enhance the pleasure of his work by making it complete throughout? It is simple enough; and of course he could save money by doing it himself. Examine an old pair of bellows (or buy a cheap set for the occasion), get a nozzle and tacks or brass-headed nails from the ironmonger's, and leather from the leather-seller's, and it is soon done. Or he can read instructions and see where materials are to be had in an excellent little work, 'Hints on Wood-Carving,' by Miss Rowe, School of Art Wood-Carving, City and Guilds Institute, South Kensington (price 1s.), page 71. I do not know where he could get prepared wood from; but no doubt Miss Rowe would be pleased to inform him, if he would drop a line to her as above, enclosing stamp for reply. Mr. E. Rogers, of Maddox Street, London, W., also furnishes all materials for wood-carving."

Iron Lasts.—W. G. (*London, N.W.*) writes, in answer to W. S. (*Highbury*) (see page 830, Vol. II.):—"You can get them at Penton and Sons', 1 and 3, Mortimer Street, W. (opposite Middlesex Hospital). They sell them in pairs—gentlemen's, 3s. 9d.; ladies', 2s. 9d.; youths', 2s. 9d.; boys', 1s. 9d.; children's, 1s. 3d."

Dry Battery.—H. E. (*London, N.W.*) writes, in reply to ELECTRIC (see page 14, Vol. III.):—"To make a dry battery, line some battery cells with stout sheet zinc, leaving a lug for connection (salt jars answer admirably, or for a smaller size those straight glass pound jars without any neck that jam is sold in). Place a carbon plate in centre, and fill in with the following mixture: Dissolve in a pint of water 1 oz. each of chloride of zinc and chloride of ammonium (sal-ammoniac), then add 1 oz. of oxide of zinc, and then sufficient plaster of Paris to make a rather sloppy paste. As the plaster would soon set and harden, add a small quantity of glue or gelatine dissolved in a portion of the liquid. When firm, pour melted paraffin wax over the top, to prevent evaporation. Make two air-holes through the wax, and keep in a cool place. Agglomerate Leclanché cells can be transformed into dry batteries by mixing with the ordinary solution—plaster and gelatine—and sealing over with wax. I had some of the latter working very satisfactorily; but being mixed without the gelatine, and kept in a rather warm place, they dried up in about five months."

Engraving.—L. S. L. (*Kirkcaldy*) writes, in reply to C. P. (*Wanstead*) (see page 765, Vol. II.):—"A very simple way to engrave the names mentioned by C. P. (*Wanstead*), or such-like work, is to heat the plate in front of a fire or over a spirit lamp; rub the whole surface, both face and back, over with a piece of paraffin wax, and when quite cool, write with a strong needle point, after which the plate should be immersed in a bath of nitric acid and water until the writing is bitten sufficiently deep. Should the plate be attached to a leather collar, of course it must first be removed, or a 'wall' formed round the space to be occupied by the writing. This also can easily be done with the paraffin wax. With ordinary care very beautiful results may be obtained."

V.—BRIEF ACKNOWLEDGMENTS.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—M. D. C. (*Liverpool*); T. E. (*Liverpool*); T. A. G. (*Stratford, E.*); DOWN; JOINER; A. H.; INQUIRER (*Birmingham*); F. R. H. (*Regent's Park, N.W.*); J. S. (*London, W.C.*); J. W. (*Edinburgh*); C. H. B.; A CONSTANT READER (*Dewsbury*); T. M. (*Gateshead-on-Tyne*); F. C. (*Manchester*); R. E. A. (*Sheerness*); DESIGNER; J. G. P. (*Crewe*); J. C. (*Bristol*); H. W. (*Wimborne*); J. H. I. (*St. Helen's*); F. C. (*Peckham*); W. M. (*Market Drayton*); INQUIRER (*Eccles*); B. A. B. (*Hampstead, N.W.*); H. D. P. (*London, E.C.*); G. P. (*Camberwell, S.E.*); F. P. (*Taunton*); J. W. (*Liverpool*); T. S. (*Carlisle*); J. G. (*Glasgow*); G. S. L. (*Hampstead, N.W.*); J. J. (*Stoke-on-Trent*); W. J. D. (*Manchester*); PEN AND INK; CHECKERED; H. W. (*London, S.W.*); G. H. (*Darlington*); C. E. (*London, N.*).

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